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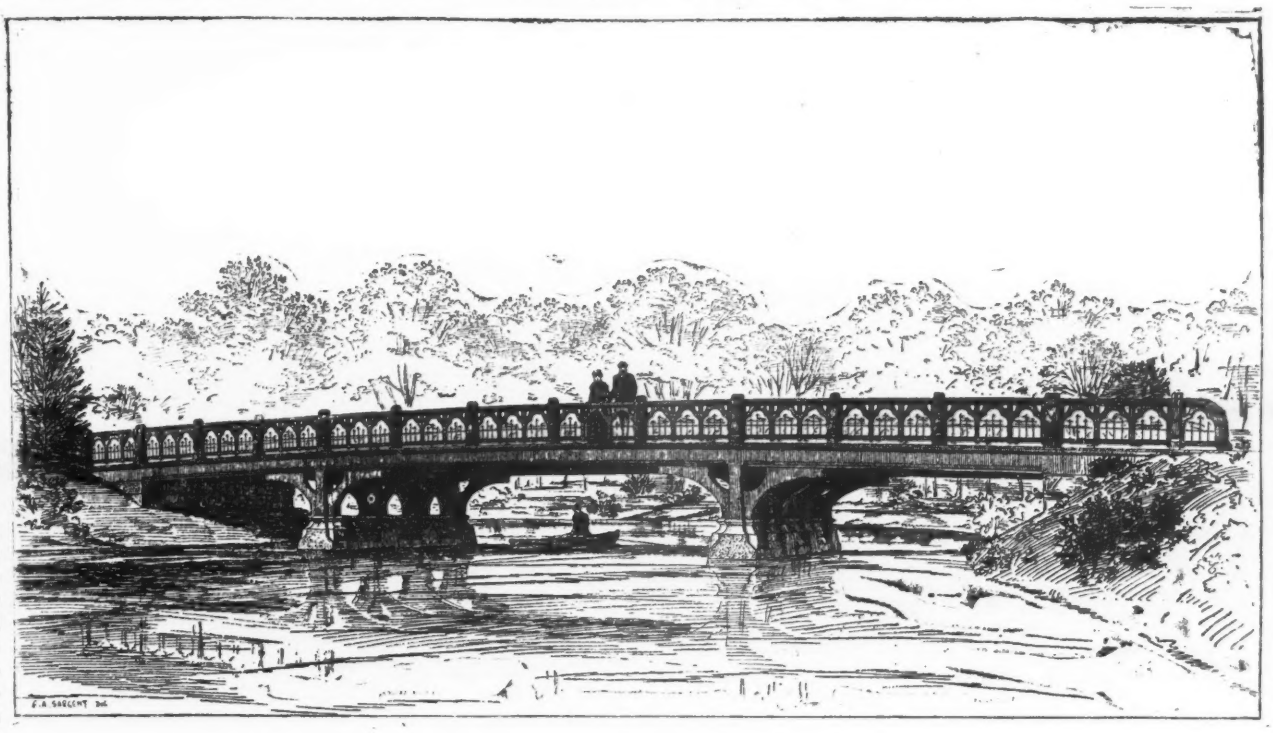
The Lullwood Bridge of Prospect Park, Brooklyn.

THIS elegant monument of architectural skill, an engraving of which appears on this page, is constructed of stone, wood and iron. It crosses the lake in Prospect Park with a span of 70 feet, between the abutments; the entire length of the bridge being 84 feet. This span is divided into three parts, leaving the middle portion, intended for a free passage for skaters or boats, 33 feet wide between centres of posts. The masonry is constructed of granite with blue stone backing. The work above the masonry, constructed apparently of wood only, is in reality built of hard oak and wrought iron, which accounts for its extraordinarily light appearance for a wood construction. The details are as follows: The main girders are composed of two thicknesses of wood, each 4¼ inches thick and 15 inches high, with wrought iron plates between them, which are 15 inches high and ½ inch thick. These three thicknesses are well bolted together by ¾ inch bolts at distances of 2 ft. 6 inches. To decrease their elasticity, the plates are connected with wrought iron braces 6 in. by ½ in., which rest on iron shoes, placed upon the granite bars. These braces are inside of the wooden knees, forming the large brackets, which are merely decorative without the iron braces; but become part of the construction, after being connected with the iron by bolts. The two outside girders are faced with 2½ inch stuff, and the whole floor, girders and rail form a curve of 750 375-1000 feet radius to a length of arc=70 feet. The strength of this curve is made available by the construction of the abutments at either end of the bridge, where the girders are sufficiently backed up with stone to resist any side pressure that might be caused by an extraordinary weight acting upon the handsomely executed curve of the girders. The sinus versus of the separate pieces between the posts of the railing (which runs concentric with the girders) being practically too small for execution, they were worked straight—but nevertheless, the railing, as a whole, appears like a good curve on account of the interruption of the posts. The plane of the walk and 7 feet at each end form a tangent to the curved surface of the bridge. The railing is constructed of solid oak and wrought iron, except the finials and sockets of the bars, which were made of cast iron, to save expense. The floor is tongued and grooved, and caulked with rope and rosin. It is thus made tight, like a ship's deck.



LULLWOOD BRIDGE

OLMSTED, VAUX & CO. LANDSCAPE ARCHITECTS

The Bridge is so located that when seen from any of the surrounding elevated points, such as Prospect Hill, for instance, it adds largely to the beauty of the Park scenery. To maintain its effect in the picture, it is to be hoped that the original color of the oak wood will be preserved by keeping all parts exposed to the weather well covered with linseed oil, in order to prevent them from turning gray. We are indebted for the above description to Mr. EDWARD C. MILLER, Architect, 4 and 6 Broad street, New York, the gentleman under whose special superintendence the bridge was constructed.

maginary Effects of the Earth's Rotation on Running Water and Railroad Trains.

WONDERFUL effects are ascribed to the earth's rotation by some would-be philosophers. We heard a professor from Cuba, a few days ago, assert in a scientific club in New York, that from this cause the diameters of trunks of trees are greater from east to west than from north to south. He was, however, soon put right in this respect by one of our well known New York professors, who remarked that this is only due to the sun, which, by its east-westerly course, gave most light and heat to the trunk on the east and west sides in the tropics, while in the northern hemisphere the north side, and in the southern hemisphere the south side, of the trunk was less developed in its ligneous structure, (always forming under the bark) by the want of the great agent which induces all vegetation. He further remarked that in a horizontal section of any trunk, the cardinal points of the compass may be recognized by the centre of the year-rings, which is, in the northern hemisphere, always nearest the bark at the north side, where the year-rings are closest together, while on the south side they are farthest apart. In the southern hemisphere the reverse is the case.

Another supposed effect of the earth's rotation is, that when water runs out of a funnel, or out of the bottom of any circular vessel, it will acquire a circular movement, which, being induced by the earth's rotation, is always from west to east. When this experiment, however, is tried fairly, it is found that the water, left to chance, will just as often rotate one way as the other, and moreover, that the motion of this rotation depends solely on the first impulse of motion. The slightest beginning will increase considerably, so that even the direction in which a single drop falls, in the liquid, will determine the rotation. A liquid running out of an opening in the middle of the bottom of a circular vessel is, as it were, in unstable equilibrium, and having a strong tendency to rush obliquely to the exit, is very ready to acquire a rotation in either direction, right or left.

Again, it has been asserted that rivers flowing in the direction from the poles to the equator, have a tendency to encroach on their westerly banks, while those running in the opposite direction encroach on their easterly banks. This supposition originates undoubtedly from the observed fact that north winds obtain a northeasterly, and south winds a southwesterly direction, by reason of the earth's daily rotation; but the supposition in regard to the rivers does not agree at all with experience, as will appear from the solution of the following problem:

The author of a paper on the causes of the Gulf Stream, read a few weeks ago before the Polytechnic Club of the American Institute, asserted that a railroad train, upon a track running north and south, as, for instance, the Hudson River Railroad, will, in case of running from the track, always run off at the west or right side when going south, and at the east, or again the right side, when going north. It is evident that this hypothesis is founded on the same premises as the former. We will therefore test it with a little arithmetic.

In order not to trouble the reader with a trigonometrical calculation necessary to find the velocity of a certain point of the earth's surface, beyond the equator, we will suppose that we have a flat disk, of 8000 miles diameter, (thus about equal to the earth's diameter,) and rotating around its centre in twenty-four hours. The effects of the sideward tendency of a locomotive running towards the centre, will in this case be much stronger than on the earth's surface; and if we can prove by a simple calculation, that it is so very small as to be practically imperceptible, we shall have proved the fallacy of the above assertion. In such a disk, rotating with a velocity equal to that of the earth, every point on the circumference will move 1042 miles per hour, or about 1,500 feet per second. A locomotive, making forty miles per hour, will move about fifty-eight feet per second; consequently, when travelling from the circumference to the centre, it will in one second have reached a circle of a radius fifty-eight feet shorter than the radius of the exterior circle. The latter radius is about 21,120,000 feet; of this number fifty-eight is nearly 364,000th part; and consequently the velocity of the rotating disk in this circle is one 364000th part smaller than 1500 feet per second, which is less than one-twentieth of an inch. When the locomotive, then, with a velocity of about forty miles per hour, moves from the circumference towards the centre of this revolving disk, it would, if there were no rails nor friction to hold it to its course, deviate about one-twentieth of an inch, in a course of 58 feet. In other words, the power driving it does not act exactly in the direction of the rails, but has an oblique tendency of one-twentieth of an inch in every fifty-eight feet, or about one to 14,000. It is evident that this amounts to absolutely nothing, compared with the sideward pressure of the wind, curves in the road, etc.

Applying this calculation to the earth, it is clear that between the tropics these differences will scarcely exist at all, since the parallel circles have nearly the same size. At 30° and 40° latitude, north and south, they commence to differ more; and here the oblique tendency of a speed of 58 feet per second upon a locomotive, would be about one forty-fifth of an inch. At the latitude of New York State, and all States between 40° and 50°, the difference in the size of the parallels, 58 feet apart, is nearly half that of the circles on a disk, and consequently the tendency of a locomotive to leave the rails on the east side when going from New York to Albany, will be one-fortieth of an inch on 58 feet, or equivalent to the tendency on a curve which deflects the rails westward one-fortieth of an inch for every 58 feet. Such a curve has a radius of not less than 30,000,000 feet, or nearly 6,000 miles. It is clear that it could be practically equivalent to a straight line, and could not have any perceptible effect on the tendency of a train to leave the rails.

Very near the poles the effect is still smaller. Let us imagine a parallel, where the velocity of the earth's rotation is equal to the mean velocity of locomotives, 40 miles per hour. This gives for 24 hours a circle of 960 miles, which corresponds to a radius of 153 miles, or 800,000 feet, nearly. A locomotive running straight to the pole with this velocity, would in one second be 58 feet, or about one 14,000th part of 800,000 feet nearer to the pole; consequently it would after one second be in a circle one 14,000th part smaller, and therefore revolving with one 14,000th part less velocity and giving a sideward tendency of this amount for every 58 feet distance; this now amounts to only one-twentieth part of an inch, or about that of the theoretical experiment with a disk, and therefore corresponds with the tendency to run from the track in a curve of about 4,000 miles radius, equal to the curvature of the earth. This is a maximum. For the last second before reaching the pole, the effect would be but one 2,000th part of an inch, and at the pole, as at the equator, it would be zero. This is anothe

proof of the worthlessness of vague theories, which a little arithmetic will entirely upset. What is true of arithmetic is equally true of the whole field of mathematics. The study of geometry and algebra cannot be too highly recommended to all young men who aim at accurate and thorough knowledge, applicable to the problems of daily life.

Great Inventions and Their Consequences.

From the Report of Dr. F. A. P. BARNARD, United States Commissioner to the Paris Exposition.

IF we attend to the current history of invention, we shall observe that much the larger number of the contributions to industrial advancement which present themselves in the form of new processes in the arts or new adaptations of mechanical principles to manufacture, are of the secondary and relatively unimportant class above distinguished.* But what each single invention may lack in its separate importance is amply compensated by the combined value of the immense number which are continually and simultaneously originating. The general growth of productive industry in the world is, consequently, nearly uniform and steady. At distant intervals there may occur a sudden swell in the wave, in consequence of the appearance of one of those rare inventions which are destined to give to some great branch of industry an entirely new character, or whose stimulating influence makes itself felt throughout all industries; but the current never sets backward, and whatever is gained from each of these extraordinary impulses remains a permanent acquisition.

To illustrate by example the nature of these occasional and singular impulses, we may refer to the consequences which have followed from the invention of the cotton-gin. So long as no better mode had been thought of, of separating the seed of the cotton-plant from its accompanying fibre, but that of picking out each seed by hand, there existed a natural and entirely effectual obstacle in the way of making this valuable material the basis of a great manufacture. Whatever might be the demand, there was a physical limit to the supply. There can, of course, be no doubt that it was the demand which enlisted ingenuity in the endeavor to overcome the obstacle, and to make an increase of the supply a possibility. It was, therefore, the demand which produced the machine. And it is, accordingly, no injustice to the ingenious inventor to whom we owe it, meritorious as we admit him to have been, to say that, had he not turned his thoughts in this direction, nor devised this particular mechanical contrivance for performing a work of which the world had so pressing need, some machine, in all material respects equivalent to this, must have made its appearance without any long delay. Of the many minds then directed towards the solution of a problem of so vast importance, though none, indeed, yet perceived how vast, some one, or perhaps more than one, must have resolved it successfully, had not the opportunity been taken away.

But if it is correct to say, on the one hand, that the demand produced the machine, it is no less true, on the other, that the machine stimulated the demand to a most extraordinary degree. From the insignificant amount of 150,000 pounds of American cotton received in England in 1791, the exportation to that country rose in ten years to 15,000,000 pounds. At the same time, the practically unlimited extent of soil adapted to this culture on the American continent, made it evident that the demand might grow to any extent without producing a corresponding increase of price, or even with an actual reduction. Such a supply of material capable of being wrought into the largest variety of textile fabrics, could not but stimulate the introduction of numerous and signal improvements into all the processes of manufacture. Thus the creation of the automatic machinery, by which the production of cotton fabrics, early within this century, rose to a hundred-fold what it had been at the close of the last, and by which, in the year 1860, it had been brought to a thousand-fold at least, was a direct consequence of the invention of the cotton-gin. Nor was the influence of this invention confined exclusively to matters of industrial or economical importance. It affected profoundly the social condition of multitudes in both hemispheres, and in one of them involved very grave political consequences. * * *

The industrial revolution which followed the invention of the cotton-gin, was confined to a single, though an extremely important, branch of industry. In some rare instances, an invention has appeared whose wider relations to the means of production have extended its influences to many industries at once, and even ultimately to all industries. Such an example presents itself in the case of the steam-engine. Before the introduction of this machine, all heavy industrial operations were effected by the muscular force of men or animals, aided, where circumstances permitted, by the power of running streams. The winds were laid under contribution for certain lighter industrial tasks; but it needs very little reflection to perceive how limited must have been, and must always be, the range of their usefulness. The productive power of any industry must always be limited by the amount of force disposable for its purposes. While the only considerable force, except that of animals, at the disposal of man, was the force furnished by falling water, it is obvious that all great industrial operations were confined of necessity to certain localities. No great factories, no great foundries or rolling-mills for iron, no great flouring-mills for grain, could exist, except in those rugged districts through which the mountain torrents make their way to the lowlands or the ocean. The broad and level tracts which form so vast a proportion of the habitable continents, and which by their fertility are adapted to sustain the densest population, could have no part in these great industries. Nor was it a slight inconvenience that, as a general rule, the power and the material on which it was to operate, were not to be found on the same spot. As the power did not admit of transportation, it was necessary to carry the material to it—a necessity involving much loss of time and labor, and no slight expense. The transportation to great distances of raw material, though in the existing state of many industries it is often necessary, is attended with great and obvious disadvantages which it is desirable to avoid. The part of this material which becomes ultimately utilized in the manufacture, constitutes in many cases but a small proportion of the entire weight, and perhaps a less proportion still of the bulk; so that the greater portion of the expense of transportation is paid for the moving of substances which are not only useless, but which must be got rid of before the remainder can be useful. These are disadvantages under which all grand industries labored while dependent upon water-power alone. Nor were these all, for it is probable that in some branches, at least, they could never have reached their present development, had they continued to be always so dependent. For the highest uses of industry, it is not enough to have at command a great amount of power; it is also indispensable to be able to concentrate it upon occasion within small space. In the British and French departments at the Exposition might have been seen armor-plates for ships, originally rolled from twenty to thirty feet in length, from three to six feet in breadth and from eight to thirteen inches in thickness. The force required to drive these masses through the rollers from which they receive their form, could hardly be conveniently obtained from a water-power. Moreover, the massive hammers now required to forge the huge masses from which these plates and other gigantic objects are formed, would be wholly unmanageable without the use of steam.

The steam-engine not only does the work of water equally well, but it does it equally well under every variety of circumstances. It furnishes power in any amount that may be required, and in any place. If a raw material is to be manufactured, the power may be set up where the material is to be produced. Place it in the forest, and it will reduce the trees to the form of lumber for the market; or, if more is exacted of it, will mould them to finished forms, ready to be united by the cabinet-maker or the joiner. Place it by the side of a quarry, and it will convert the rude blocks of marble, disengaged by the workmen, to geometrical shapes, suitable to be laid in the walls or to adorn the interior of a palace. In the mineral regions, it offers its services to the metallurgist in every branch of his difficult labor. It blows for him the bellows—it lifts the heavy hammer—it turns the powerful lathe—it drives the steady tool of the plane—it crushes between resistless jaws the fiery masses which are to form the iron ways of our railroads, or the ponderous walls of our floating batteries. In a country favorable to the textile arts, it performs with incredible rapidity and facility all those operations which for so many centuries were accomplished by the slow and painful labor of human hands, separating the useful fibre from its impurities, loosening its entanglements, preparing it for the spindle, drawing it out into threads, and finally weaving it into fabrics of endless variety and beauty; performing, also, all this work equally well upon a hundred looms at once, or upon a single one.

Besides this, the steam-engine presents itself as a ready helper in all the minor industries, which, until its introduction, had no resource but that which was afforded them in animal power. The turner, the wheelwright, the carpenter, the joiner, the locksmith, the brass-founder, the lapidary, the printer, the optician, the confectioner, the baker, the agriculturist, may now accomplish the most laborious part of their several tasks, with only the personal exertion on their own part which is necessary to superintend, and, from time to time, to guide the work of the tireless assistant which they find in the steam-engine. In agriculture, the advantage which the engine is capable of affording is but recently beginning to be realized, but already its use is all but universal in England, and is becoming general in our own country, in threshing out the grain crop; and it is beginning to be successfully employed in driving the plough and the cultivator. A single English engine-building house sold, in 1852, two hundred and forty-three portable engines for farms, representing a horse-power of 1349; in 1862 the number was more than doubled, and the horse-power increased threefold.

Another industrial revolution, no less important than those already mentioned, has resulted from the invention of the steam-engine. With the advancement of mechanical art, precision in the execution of its processes becomes a requisite more and more indispensable. In the early period of the history of industry, and even until a time comparatively recent, no higher precision was obtainable than that of which the human hand is capable; and this could be secured only through the trained skill of the most accomplished artisans. Moreover, in proportion as the dimensions of the work to be executed were larger, or the weight of the mass to be operated on more considerable, the difficulties of the task were proportionally increased, so that a practical limit to accuracy was very soon reached. The state of the mechanical arts in this respect at the time of WATT's invention is well illustrated by the historical fact that, for more than ten years, owing to the impossibility of constructing a piston and cylinder steam-tight, the conception of the engine could not be realized in practice. This difficulty had nearly disheartened the inventor and ruined his associates, when, at length, Mr. BOULTON, a capitalist, but, happily, also a metallurgist and engineer, entitled by his ingenuity, energy, and practical skill, to be distinguished as the WHITWORTH of his day, came to his relief, and by means of the exceptional superiority of workmanship to which he had attained in his celebrated establishment at Soho, saved to the world the most valuable invention which had ever then been offered to its acceptance. And yet, though the invention was at last successful, it was but barely so. The earlier engines produced by WATT and BOULTON would be regarded at this time as but little better than monsters of rudeness.

But the engine having succeeded, and having relieved the mechanical artisan of the drudgery attending his task, became presently an instrument of improving most remarkably the quality of his work. It was soon perceived that an iron arm could direct a tool with a precision which the most practiced human skill could never attain. The class of mechanical contrivances called machine tools came into existence; and, in the manufacturing world at least, the file, the plane, the chisel, the auger, and the drill in the hand of man, except for the most trivial and unimportant purposes, entirely disappeared. With this change, also, there ceased to be a limit to the improvement of mechanical art, short of absolute perfection. Accuracy of workmanship has now reached a point at which the gradations of difference in dimension, which it is perfectly in the power of the workman to give to an object on which he is employed, are entirely too minute to be perceptible, except by the aid of powerfully magnifying helps. A remarkable illustration of the fact here stated is furnished by Mr. WHITWORTH in a little contrivance for measuring, or rather for comparing, lengths, which is exposed by him in the annex in which his heavy guns are exhibited. The apparatus is designed to test the truth of a solid measure representing in length an English inch. It embraces, as exhibited, the standard inch with which the new one is to be compared. This solid has the form of a rectangular prism, originally nearly or quite cubical. It is formed of polished steel. Its extreme edges have been truncated rectangles of forty-five degrees, so as to reduce the terminal surfaces to the dimensions of about a quarter of an inch square. The lateral edges are also rounded, in order to facilitate the manipulation. It rests on a rectangular trough, of which the sides are equally inclined to the horizontal. At one of its extremities it abuts against a fixed stop, which is provided with the means of the necessary adjustment. The other is opposed to the extremity of a screw of twenty threads to the inch, placed directly in the line of the axis. A single revolution of the screw advances the extremity, therefore, one-twentieth of an inch. But the head of the screw is ten inches in circumference, and is divided into two hundred parts. In turning this wheel, every division accordingly advances the screw one four-thousandth part of an inch. The divisions, however, are not traces, but teeth; and the screw-head is a gear-wheel, which is driven by a tangent screw lying horizontally in its plane and across its summit. And this tangent screw has also a head of twelve and a-half inches in circumference, which is divided into two hundred and fifty parts, each part being the twentieth of an inch. An entire revolution of the tangent screw advances the gear-wheel only one tooth, which, as we have seen, moves forward the end of the measuring screw one four-thousandth of an inch. A single division of the limb of the tangent screw-head will therefore produce a movement in the direction of measurement of only one two-hundred-and-fiftieth of one four-thousandth of an inch—that is to say, of one one-millionth part of an inch; and to this degree of refinement it is Mr. WHITWORTH's belief that mechanical accuracy can be practically carried.

It might be said in objection, that while there is no fault to find with the correctness of the mathematical conclusion deduced from the known relations of the parts of this instrument, yet from the possible flexure or compression, or slight imperfection in the fitting of parts, there is room for error to the extent certainly of so minute a fraction as one one-millionth part of an inch; a fraction so minute that not only the senses fail to detect, but the mind is even incapable of conceiving it. Mr. WHITWORTH has anticipated this objection, and has met it by a practical and very ingenious answer. Between the plane face of the standard inch and the extremity of the measuring screw opposed to it, he has introduced a little steel plate with parallel and perfectly true surfaces, from the two opposite ends of which, for convenience of manipulation, there extend two slight arms in the direction of its plane. Before the measurement is begun, the screw-head is turned far backward, and this plate lies loosely between the screw and the standard, with its plane vertical, being sustained in this position by its arms, which rest on supports on each side. As the screw advances in the operation of measurement, the plate has less and less freedom of space, until at length it appears to be in actual contact with both screw and standard. But that this appearance is deceptive, is easily demonstrated by raising the plate slightly by means of one of its handles, when, on being released, it will fall freely back, showing that it is not yet impeded by friction. If, now, the tangent screw be turned, a single division at a time, lifting the plate after each movement, a point will be reached at which, from perfect freedom, a single additional division of advance will fasten the plate completely, so that when lifted it will be held by friction at the point where it is placed, and will no longer fall. Between these two positions the screw has advanced one one-millionth of an inch; and the certainty that this is a real and not an ideal accuracy of measurement is proved by the fact that the operation may be repeated, and that, provided care be taken to provide against disturbance of the equilibrium of temperature, the arrest of the plate will continue to occur between the same two divisions of the screw-head. * * * * * * * *

But the steam-engine has not only increased the accuracy of constructive art; it has also greatly extended its power. Undertakings of a magnitude which could not have been attempted, and which would probably not have been thought of without it, have become by its aid operations of daily accomplishment, and are too familiar to attract especial notice. A mass of thirty or forty tons of metal is now wrought upon all its surfaces and transformed into any desired shape with greater facility and in vastly less time than would have been required at the beginning of this century to deal with half as many hundreds. This truth is illustrated in the immense ocean steamer crank-shaft exhibited by Mr. KRUPP, wrought to its present

* Namely, such as do not change the essential character and purpose of a machine, or do not accomplish any new result.—ED.

difficult form, with elbows at right angles to each other, from a mass of twenty-seven tons, which in the operation has become reduced to fifteen; or the similar shaft exhibited by Messrs. PETIN & GAUDET, of France; or the fifty-ton steel gun of the first-named exhibitor, and the twenty-five-ton gun from Woolwich; and the equally ponderous artillery shown by Mr. WHITWORTH, and by the government of France. To these illustrations may be added all the magnificent and splendidly finished forgings of the marine engines exhibited by the Creuzot works in their annex and on the Berge, to say nothing of the massive frames and bed-plates of the great machine tools themselves, the planing mills especially, exhibited by WHITWORTH of England, SELLERS of the United States, MAZELINE of France, and many others.

There remains to be mentioned one additional and most important consequence of the invention of the steam-engine, which has impressed profoundly not merely the industrial but the political history of the world. If the cotton-gin has been for much in controlling the political and social destinies of the western continent, the steam-engine has been for still more in fixing for England her place among the nations of the earth. At the time when this splendid invention made its appearance, England called herself mistress of the seas, and assumed to be the equal, if not the superior, of any military power upon the land. This place she still claims, perhaps justly, though her title to the exclusive dominion of the waves can no longer pass unchanged. But without the steam-engine, the power of England would have long since suffered a hopeless paralysis. It is from the depths of her mines that she has drawn the aliment which has sustained her manufactures and fed her boundless commerce and built up the enormous wealth which is the basis of her present strength. Her iron and her coal have made her a hundred times richer than she could possibly have been if she had possessed instead of them all the gold of California and all the diamonds of Brazil. But a century ago, just as WATT was turning over in his mind his first crude notions of the motor which was destined to transform the constructive industry of the world, many a thoughtful patriot and statesman of Great Britain must have been regarding with anxiety and alarm the stagnation which seemed to be gradually creeping over the mining industry of his country, and the danger which menaced with speedy total extinction this great source of her national wealth. As the mines were sunken deeper, the expense of lifting to the surface the mineral extracted, of course, increased; but this was a trifling consideration compared with the vastly greater expense of withdrawing the water which flowed in, in constantly increasing abundance, and which had to be raised from a constantly increasing depth. In many instances mining had almost ceased to be remunerative; in many others quite. One after another the mines were abandoned and the water was allowed to fill them up. What had already happened in many instances could not fail to happen at length in all. An early ruin plainly impended over the mining industry of Great Britain, which could not fail to bring with it, and with the consequent failure of her fuel, an equal ruin to the manufactures, the commerce, the wealth and the political power of the British empire.

It was at this critical juncture that the new motor appeared. For some time after its appearance, it was only for the drainage of mines that its immense powers of usefulness seem to have been recognized. So imperfect at that time was the state of advancement of the mechanic arts! But applied to this purpose, then of paramount importance, it averted at once the imminent danger which menaced British industry, and restored to Britain the commercial sceptre just as it was about to fall from her grasp. The greatness of the British empire to-day is, therefore, clearly due to her early possession of the steam-engine. Without it she must inevitably and speedily have sunk to a level of comparative insignificance.

[WE publish the following letter just received from Dr. STAPFF, merely remarking that the number of the corrections is due to the fact that the distance of the author from New York rendered it impossible for him to revise his articles before they were published.—ED.]

No. 312 SOUTH FIFTH STREET, ST. LOUIS, Mo.

TO THE EDITOR: Sir—In perusing the five letters hitherto printed, I note some typographical errors, which should be indicated, so far as the meaning is disfigured by them, namely:

The Anderren furnaces, frequently mentioned, should be Andover.

Page 34, first column, line 10 from above, for zinc mines at Bethlehem, read zinc-works at Bethlehem.

Page 34, first column, line 19 from above, for Mr. Banks, read Mr. Danks.

Page 34, second " 3 " magnetites, read martites.

Page 34, " " 14 " parti-colored, read partially.

Page 34, " " 43 " thirty per cent., read thirty-six per cent. when burnt.

Page 34, third column, line 30 from above, for worked, read coked.

Page 34, " " 50 " below, " Lochridge, read Irondale.

Page 34, " " 49 " magnetic ores, read martite ores.

Page 50, third column, line 35 from below, for Lockridge, read Irondale.

Page 50, " " 33 " tons, read pounds.

Page 51, first " 33 " filled, read fitted.

Page 51, second " 29 " above, for base, read bosh.

Page 51, " " 37 and 38, " a number of gas receivers—are, read an annular gas receiver—is.

Page 51, second column, below FIG. 4, for 3 tuyers, read 8 tuyers.

Page 51, " " " FIG. 6, 5½ (indicating height of hearth) read 5½ feet.

Page 51, third column, below FIG. 7, for 4 (width of gas cylinders), read 42 inches.

Page 51, third column, below FIG. 7, for 5 (diameter of furnace at top), read 54 inches.

Page 51, third column, line 12 from above, for the cost and risk of its causes, read it causes the cost and risk.

Page 51, third column, line 29 from above, for eight inches broad, read eight feet broad.

Page 51, third column, line 74 from above, should be added, that also the Irondale furnace is built on the slope of a hill, so that the hoisting machinery is avoided.

Page 66, third column, line 44 from above, the superscription, "pumps" to be added.

Page 67, first column, last line of table, for ?, read 2.

Page 67, first note below table, line 5 from below, for 3 $Fe_2 O_3$, FeO, read 3 $Fe_2 O_3$, 2 $Fe_2 O_3$.

Page 67, first note below table, line 3 from below, for one more equivalent, read one half more equivalent.

Page 99, third column, line 57 from below, cancel duty free.

Page 99, " " 45 and 76 from below, it should be observed that the Government impost of $9 is in gold, and that the price of English pig at St. Louis, is consequently, a little higher than $35.

Page 129, first column, line 31 from below, for ore. This, read ore,—this.

Page 129, third column, line 60 " for on the ore, read in the ore.

Page 130, first column, line 40 " for assayed, read assigned.

Page 130, second column, line 3 " for 100 pounds, read 100 dollars.

Page 146, first column, line 53 from below, for 4 in. 5 in., read 4 in. to 5 in.

Page 146, first column, line 52 from below, for 0.03 in., read 0.30 in.

Page 146, third column, line 7, from above, for then being used to, read: then are used for blister steel; but it is complained, etc.

Finally, I take this opportunity to disclaim the title of "Professor," which you courteously bestow upon me in the inscriptions of the notes published—the office of instructor at the Royal Swedish School of Mines, Falun, which I have held for five years, being discontinued by the abolition of the School. I should like very well to have a Professorship, but I do not want the title without the office! F. M. STAPFF, Ph. D.

Bessemer Steel in England.

From a special report prepared in June 1867, by FREDERICK J. SLADE, under the direction of ABRAM S. HEWITT, United States Commissioner to the Paris Exposition.

The Paris Exposition affords valuable information in reference to the capabilities of the Bessemer process for the production of all grades of metal, from a near approach to wrought iron to the hardest and finest kinds of steel. A comparison of the specimens sent from the various countries shows that the quality of the metal produced depends chiefly upon the nature of the raw materials used, and accordingly it is only in those countries where the very best ores and purest coals are employed that we find the finer grades of steel produced.

It will, perhaps, be most instructive, therefore to examine the manner in which this process is conducted in each country separately, and to trace, if possible, the relation between the nature of the finished products and the materials and modes of working employed in their manufacture. We begin naturally with

ENGLAND.

The iron almost exclusively employed in England for the pneumatic process is obtained from the Cumberland district, and is derived from red hematite ores. Dr. PERCY, in his well-known work on metallurgy, gives as the analysis of two specimens of these ores:

	I.	II.
Sesquioxide of iron	95.16	90.36
Protoxide of manganese	0.24	0.10
Alumina	—	0.37
Lime	0.07	0.71
Magnesia	—	0.06
Phosphoric acid	trace.	trace.
Sulphuric acid	trace.	trace.
Bisulphide of iron	trace.	0.06
Ignited insoluble residue	5.68	8.54
	101.15	100.26
Silica	5.66	7.05
Alumnia	0 06	1.06
Sesquioxide of iron	—	0.19
Lime	—	trace.
	5.72	8.30
Iron, total amount	66.60	63.25

The blast furnaces in which these ores are smelted average about fifty feet in height and fifteen feet diameter of boshes, and are in most cases open-topped, the opinion among the iron masters being that the quality of the iron is injured by any attempt to draw off the gas. At some furnaces, however, this notion is abrogated, and the waste gases are utilized for heating the blast. Among these are the furnaces of the Barrow Hematite Iron and Steel Company, the West Cumberland, and the Wigan Iron and Coal Company's furnaces. The quality of pig produced at these latter works does not perhaps stand invariably as high as that of the Whitehaven Hematite Iron Company (Cleator), the Workington Iron Company, or the Harrington, but if there is a difference, it is easily accounted for by the quality of the materials used, without the necessity of resort to the supposition of an injurious effect from utilizing the escaping gas.

The fuel used at the furnaces in the Cumberland district is the best Newcastle coke, which is remarkable for its hardness and freedom from sulphur. Dr. PERCY gives the percentage of sulphur as 0.8 and of ash 4.45. No charcoal pig is made in England for the Bessemer process. The fluxes employed are a limestone quite free from phosphorus, and a portion of black shale from the coal beds, consisting of clay and carbonaceous matter, without any appreciable amount of sulphur. The percentage of iron indicated by the above analysis, namely, from sixty to seventy, appears to be a fair average, and the ores are not calcined. As it is necessary that the iron should be as gray as possible, not less than three hundred-weight of coke are used per ton of iron produced, and a charge is about fifty hours in coming down through a furnace of the dimensions given above. The yield from such a furnace is two hundred and fifty tons per week.

The blast is under a pressure of thirty-three and three-quarter pounds, and is heated to from 650° to 750° Fahrenheit. From four to six tuyers are usually employed. No. 1 iron for the Bessemer process from these furnaces brings ninety shillings per ton at the works, and No. 2, ten shillings per ton less.

The Wigan Iron and Coal Company, Lancashire, produce an iron which is used to a considerable extent for the process, but does not rank as high as the Cumberland irons. The coal as mined would be quite unfit for use in the production of such a grade of iron, as it is materially contaminated with sulphur, but this is almost entirely removed by washing the fine coal, the pyrites settling by their superior weight, while the pure coal is carried on to receiving beds by the current of water, and the purified residuum is then converted into coke, yielding a tolerably strong product. This company have just erected a number of new furnaces much above the usual size for this kind of iron, namely, eighty feet high and twenty-four feet diameter of boshes, and these are provided with a cone and bell arrangement for taking off the gas.

Forest of Dean iron, made from brown hematite ores, is frequently used in small quantities in admixture with other irons for the purpose of maintaining the heat of the charge, which it tends to do. It is apt, however, to contain too large a percentage of sulphur to work well alone.

Another brand which is said to work well is Weardale, an iron made from spathic ores. It is unusually rich in manganese, and owes its excellence chiefly to that fact.

The following analyses exhibit the characteristics of some of the more usual brands of iron employed:

	Cleator.	Workingt'n.	Weardale.	Forest of Dean.
Carbon, (graphitic)	4.007	3.14	3.24	3.25
Silicon	1.752	3.12	1.80	1.36
Sulphur	.....	0.05	0.04	0.037
Phosphorus	0.049	0.03	0.19	.....
Manganese	.....	0.02	1.45	.....

The analysis of Weardale is taken from Percy's Metallurgy; the others were furnished to the writer from different sources in England.

The presence of silicon in the iron causes the charge to work hot in the converter, and it is usual therefore to mix an iron rich in this element with others containing a less quantity, and which have a tendency to work cold, and become pasty. As a rule Workington iron contains more silicon than any other in use for the process, and being moreover an excellent iron, is largely used. It is, however, from the very fact of its working so hot, seldom employed alone, as it cuts the molds badly in pouring.

Sulphur and phosphorous are the most injurious elements found in the pig, because the pneumatic process is powerless to remove them, and the quality of the steel is materially affected by their presence. An effectual means of eliminating these substances, in the process of conversion, would be one of the most valuable discoveries of the times.

It is usual among all the steel makers to mix several different brands of iron where a uniform and good quality of steel is desired, but there seems to be no definite mixture which is agreed upon as best. The principle appears to be to form the larger portion of the charge of the better brands of Cumberland hematite, and to add as correctives smaller percentages of other irons. The following will serve as examples, the first having been given to the writer by Mr. F. Preston, late managing director of the Lancashire Steel Company, and the other being from the books of another large firm:

I.		II.	
Workington	45	Cleator	40
Harrington	40	Workington	20
West Cumberland	10	Harrington, (No. 1)	15
Wigan	20	Harrington, (No. 2)	5
Weardale	7	Forest of Dean	10
Forest of Dean	3	Wigan	3
	120		93
Spiegel	7½	Spiegel	6¼ or 6½
	127½		

For forgings, such as axles, tires, locomotive crank shafts, etc., none but No. 1 iron is commonly used, but for rails a greater or less amount of No. 2 is added, in order to reduce the cost as far as possible.

The amount of this quality that may be used will of course depend on the character of the iron.

The iron as a rule is melted in reverberatory furnaces, but at five works cupolas have been substituted with apparently good results. These are—

The Manchester Railway Steel and Plant Co.;

Messrs. Chas. Cammell & Co., Penistone;

The Bolton Iron and Steel Co.;

The Barrow Hematite Iron and Steel Co.;

The Mersey Iron and Steel Co., Liverpool.

At the latter a cupola is also employed for melting the spiegeleisen. At the first-mentioned works Woodward's patent steam-jet cupola is employed, it is stated, with a consumption of coke as low as 1¼ pound per hundred-weight of iron. These cupolas melt very rapidly, and are sufficiently capacious to hold an entire charge in the portion below the upper row of tuyeres. The size erected for a five-ton plant is seven feet in diameter, and will melt five tons of iron in three-quarters of an hour. In working, the charge is weighed when it is put into the cupola, and, as it melts, remains in the bottom till the whole has been fused, when it is tapped off into the converter. They generally require cleaning once in twenty-four hours. Of course where cupolas are used, much greater care has to be exercised in the selection of the coke, as fuel which might be used in the air furnaces would destroy the quality of the iron if burned in contact with it. The opinion among those who employ the cupola is, that it is quite possible to find a coke sufficiently free from sulphur to yield a satisfactory result. At the Barrow works, preparations had been made to convey the molten metal directly from the blast furnaces to the converters, but after a number of trials it was found that the uniformity of the metal could not be relied on, and, in consequence, the attempt was abandoned, and cupolas erected instead, to remelt the pigs. The converters at the majority of the works have a capacity adequate for a yield of five tons of steel, or allowing one-sixth for waste, which may be taken as a fair average, for six tons of molten iron. At Barrow, however, three seven-and-a-half ton vessels have been erected, be-

sides their five-ton plant, and at Messrs. John Brown & Co.'s a pair of ten-ton vessels have been in use more than three years. The material commonly employed for lining the vessels is ganister, a highly silicious substance, found at Sheffield. Other materials have been tried at some works, as, for example, at Dowlais, with apparently great success. A pair of vessels, at the works just mentioned, had recently stood three hundred blows each, without relining, and were still apparently in good condition. This is much above the average endurance of the refractory linings. The destruction of tuyeres is an important item in the expenses of the process. The average life of these is seldom over five blows, and the failure of one during a blow is often the cause of considerable loss, either by damage to the vessel or by injury to the contained charge.

In the general arrangement of the Bessemer plant, very few changes have been made from that planned by Mr. BESSEMER and contained in the drawings supplied to his licensees. A pair of converting vessels, usually placed opposite to each other, but in some cases side by side, stand at the side of a casting pit, sunk a few feet below the general level of the floor. These vessels are mounted on trunnions, and are revolved on them by means of a rack and pinion operated by hydraulic pressure. The melting furnaces are placed in a room having a considerably higher floor level than the converting room, so that the melted metal may be run by its own gravity into the mouth of the converter, when the latter is turned down suitably to receive it. In the centre of the pit is a vertical hydraulic piston or crane, carrying at its upper end a platform, at one end of which is a ladle sufficiently large to hold the contents of the converter at the end of the operation. The platform is furnished with gearing, so that it may be easily revolved to bring the ladle over each ingot mould successively, the latter being arranged accordingly in the arc of a circle near the side of the pit, which here has the same form. The ladle is provided with a nozzle and stopper in its bottom, by means of which the flow of the steel is regulated. Two hydraulic cranes, consisting simply of vertical pistons, carrying a long horizontal jib with a rolling carriage, to which a chain and hook is attached for lifting the ingots, are placed near the edge of the pit, about opposite the centre of the converters, and serve also to lift off the various parts of the latter when required for repairs. The blast valve and hydraulic apparatus pertaining to the converters are worked from a valve stand, placed at a suitable distance from the pit, the cranes being operated by a valve directly attached to them, so that the attendant boy may the better see what he is required to do, and the whole of the manipulation of the vessels, ladles, and ingots, gives an ease of working and a perfection of control, with economy of labor, which should lead to the more general application of hydraulic power to other departments of industry in which large masses have to be dealt with. The water pressure used for the purpose is about three hundred pounds per square inch. The sizes of ingots most commonly cast are, for rails, about ten inches square; for locomotive crank shafts, ingots of a rectangular section, say twenty-two inches by sixteen inches, and for other forgings, according to the size and nature of the work, the moulds having a weight about equal to that of the ingots. At some works, the plan is adopted of testing a sample of each blow for carbon, and classifying the metal according to the result of this test. By this means much greater uniformity in the finished work is obtained, and in the present state of our knowledge of the process, this is a very necessary means to secure this end, and should be more generally adopted. The process employed was introduced from Sweden, and is exceedingly simple in its nature. It consists in dissolving a known weight of metal, in the form of drill chips, or some other finely divided state, in nitric acid, of the gravity of 1.2. The solution will have a brown color, more or less deep according to the percentage of carbon contained in the metal. A standard color, corresponding to a known percentage of carbon, as determined by direct analysis, is first established, and the color of the solution to be tested is made to agree exactly with this by the addition of a certain quantity of acid or water. That this, which is the readiest method of producing agreement, may be employed, the standard solution must be light. The water is added to the solution in a graduated test tube, so that the exact proportion of water relatively to the original solution may be read off with ease, and if, for example, an equal bulk of water requires to be added to make the color the same as the standard, the percentage of carbon in the specimen under test would be just double that of the standard. As a solution of steel in acid would in the course of time change its color, an exact imitation of it is made by dissolving burnt sugar, and this is kept hermetically sealed for comparison. To secure a light standard color, it is not necessary that the piece of steel dissolved should contain a small percentage of carbon, but a larger quantity of acid may be used in a known proportion, say twice or three times the required amount, and the corresponding percentage of carbon will be equally well ascertained. This test is easily and quickly applied, and the variation of color being considerable, gives results sufficiently accurate for the purpose of a proper classification of the ingots according to the purposes for which they are suited.

The principal uses to which the Bessemer metal is put in England, are the manufacture of rails, tires, axles, machinery forgings, and boiler plate. The total amount produced may be judged from the fact that the quantity made per week at the works of Messrs. JOHN BROWN & Co., limited, and Messrs. CHARLES CAMMELL & Co., limited, is stated to be 600 or 700 tons each. The number of establishments is about fifteen, and of converters upwards of fifty. The chief market is for rails, and a large proportion of the orders are for American roads. In England, not much ordinary line has been laid with steel rails, but on most roads those portions exposed to excessive wear, such as stations and inclines, are being relaid with steel.

Polytechnic Club of the American Institute.

Meeting held at the Rooms of the Association, March 24, 1870, Professor S. D. TILLMAN in the Chair.

MR. JONATHAN AMORY, of Boston, presented and explained the working of what is known as the AMORY Furnace, the chief feature of which is the employment of both a slow and a quick combustion in the same furnace. This is done by keeping up a slow combustion of the fuel in a chamber by itself and conducting the resulting gases into another chamber, where, meeting currents of heated air introduced through perforated plates, a quick combustion of the carbonic oxide takes place and an intense heat results. Different forms of this furnace were noticed, which were applicable to the furnaces of steamers, locomotives, and dwellings. To show the opportunity for saving fuel in this case, the long, blue flame of burning carbonic oxide frequently seen issuing from steamers' funnels was cited, and it was shown that this waste could be entirely avoided by supplying the gas with air and burning it in the furnace. Formerly these reverberating plates in locomotive boilers burned out in the course of three or four months; at the present time, however, they can be made to last as long as the boiler itself. This improvement was used on the Lowell road some twelve years ago, in the first coal burning engine used in the country. After the reading and discussion of scientific items, which we shall endeavor to publish next week:

Steam boilers, the regular subject for the evening, was taken up, after a short but spirited debate, in which it was suggested that the name of the club should be changed to the "Steam Section" of the American Institute—a sly hit at the fact, that for one or two meetings past the subject of boilers had formed the chief topic for discussion. Mr. MCGINNIS explained the construction of a boiler intended to enable a high pressure of steam to be carried safely.

Mr. FISHER then asked the question whether a high pressure of steam, say one hundred and fifty pounds and upward, can be carried without cutting the cylinder and valve seats. The gentleman asked for facts and experience within the knowledge of the members of the club. He wanted to know whether the cutting in locomotive cylinders was from high temperature or the smoke drawn in through the exhaust.

Mr. MONTGOMERY thought there was much misunderstanding on the subject of high pressure steam. He had been on boats on the Mississippi river where they carried four hundred and fifty pounds to the square inch; he had been on them when they carried five hundred pounds; and he had been on them when the pressure was so high that he wanted to get on shore. He had seen the engineer tie pig-lead weights to the safety-valve, and even when he had no greater weights, add his own weight to those already on the safety-valve cord. Now, as to the condition of these cylinders, he said that, though the water frequently primed, (and this was owing to the muddy water of the Western rivers), "the inside of the cylinders were as bright as a dollar." It was all bosh about the cutting. The old-fashioned copper boilers, formerly used in this country, were spoken of. They were very weak, and twelve pounds to the square inch would have been dangerous on one of them. FAIRBAIN'S experiments of making a boiler stand a pressure of sixteen hundred pounds to the inch, proved there was no difficulty in making the boiler bear almost any pressure. A captain of an Alabama steamer once wanted him to build a boiler that should carry fifteen hundred pounds to the square inch. Of course, he refused, but the captain got a boiler and habitually carried five hundred pounds to the inch, with the result that the boiler exploded, and sixty lives were lost. The value of high pressure over low is immense, and boilers can be made perfectly safe for even five hundred pounds to the inch. In steamers the boilers should be on deck, where space is cheap, for when a ship leaks the fires are put out at once when they are only a few feet from the bottom. The case of the San Francisco, lost some eighteen or twenty years since, was mentioned. In her case the fires were put out and she was rendered helpless in the very beginning of the gale.

Mr. AMORY then alluded to the fact that she had been overloaded with coal, (having to make the voyage round the Cape). An effort was made to introduce his improved furnaces on board her, and if it had been done she would have probably been saved. The captain said if he did not meet a gale for forty-eight hours he would be safe, as he would then get rid of about four hundred and fifty tons of coal, and be light enough to meet a storm. But the four hundred and fifty tons were not burned, the gale striking her in less than forty-eight hours, and the ship was lost with one hundred souls.

Mr. MONTGOMERY continued that he was on board the steamer Great Western (reporter is not sure of the name) when she was in a heavy gale. The seas made a clean sweep over her, and went down the ventilators into the fire-room; and as the vessel rolled the water put out all but the central fires. But with these they managed to keep up three-quarters of a pound pressure to the inch, and working the engines with that saved the ship.

Mr. ROOT thought there was no economy in a pressure above one hundred or one hundred and twenty pounds to the inch, as the difficulties encountered above that point overbalanced what gain there might be.

Mr. FISHER asked if there was any trouble in the cutting of cylinders, etc. No, there was no cutting of cylinders if the proper kind of metal packing was used; but it was impossible to use a slide valve at these high pressures, a balanced slide requiring a great deal of attention. In western waters the poppet-valve was used altogether, which avoided the difficulties of the slide. But the economy even then was doubtful.

Mr. EMERY had performed a series of experiments to show the relative economy of steam at different pressures, and to determine at what pressure it is most desirable to work. Sixty pounds to the square inch is the lowest at which a non-condensing engine should ever run. The most economical results are to be found between ninety and one hundred pounds. Above the latter point, the gain is very slow indeed, one hundred and ninety-five being only seven per cent. more profitable than ninety. High pressure in boilers can be kept up for years without danger, if the boilers are properly constructed. At high pressures, he thought the cost of obtaining a saving too great to warrant the outlay. On the contrary, the loss is enormous below eighty pounds, which should be the minimum, and one hundred pounds the maximum.

The Rolling of a Great Plate.

WHILE the Paris Exposition was still in progress, Sir JOHN BROWN, of the Atlas Iron Works, Sheffield, England, caused to be rolled a plate, surpassing in dimensions the largest of the immense masses heretofore known; its length being twenty feet, its breadth four feet, and its thickness *fifteen* inches. Even this extraordinary achievement by no means exhausts the power of the mills or the capacity of the furnaces; but plates are rolled no larger, only because larger plates have not been demanded, and because no floating battery could carry them. The scene presented in the Atlas works at the time of the rolling of this huge plate, is vividly described by a correspondent of the London *Times*, who was present on the occasion. It is quoted as furnishing a most striking illustration of the extraordinary change which the steam-engine has wrought in the most important of the world's industries:

"The plate was not quite ready at the time appointed, and during the short interval of delay, the works were inspected. It is almost impossible to describe the aspect of cyclopean activity which they presented. The huge space of lofty workshops, covering more than twenty-three acres of ground, were, above, all dim with smoke; below, all dazzling with the blinding glare and heat of furnaces. Everywhere ponderous fly-wheels were spinning round with a loud hum through the gloom—everywhere steam-hammers were falling with a shock upon the solid earth that made the walls vibrate, and people near them jump under the tremendous concussion. No place seemed free from steam or flame or melted iron. The dark nooks would suddenly become bright, as furnace-doors were lifted and emitted their long, light-looking flames of dazzling white vapor, and disgorged a mass of seething metal, which men, almost clad in light steel armor, wheeled away and shot under the steam-hammers, the first stroke of which sent jets of melted iron rushing in trains of fire like meteors in all directions. Sometimes one came on groups of men who were saturating in water the rough bands of sacking in which they were enveloped before going to wrestle with some white-heat forging—sometimes on men nearly naked, with the perspiration pouring from them, who had come to rest for a moment from the puddling furnaces, and to take a long drink of the thick oatmeal and water, which is all that they venture on during their labor, and which long experience has proved to be the most sustaining of all drinks under the tremendous heats to which they are subjected. On every side the glare, the smoke, the din, and steam are alike deafening and blinding. On every side are masses of melted iron running down troughs, or great blocks of it heated to a glow that is almost melting, being welded and knocked away in myriads of sparks and jets of refuse under the blows of the hammers. Most uncomfortable of all are the slabs of armor-plate and blocks of steel ingots, which, half cooled, and of a dull slate color, lie about everywhere. From those in a bright red glow the visitor can guard himself, for he sees them; but from those which are partly cooled, but yet hot enough to scorch the flesh from the bones when closely approached, there is little safeguard as one hurries out of the way of seething puddle-blooms or open furnaces, which infuse such an intense general heat around, that little extra warning is given by the treacherous masses of half-cooled slabs till the danger is almost too near to be avoided.

"After seeing and suffering under seeing such scenes, the visitors were conducted to the armor rolling-mill, where the monster plate was to be drawn. The process of drawing it is simple, but peculiar. The plate, when laid in the furnace, rests upon little stacks of fire-bricks, so that the flame and heat plays equally round it till all is glowing white, and the successive layers have settled down into one dense mass. A great deal of the success depends upon the time at which the plate is drawn, and the amount and length of time to which it is to be heated. All this is regulated by the chief roller and chief furnace-man, who are paid wages which many eminent professional men might envy—wages amounting from £1,200 to sometimes £2,000 a year. As the time for 'drawing' approached, these officials opened the furnace doors, and approaching close to them with only the shelter of a lump of wet rag held loosely before their arms and faces, peered into the blinding glare from time to time with as much care, and apparently as much indifference, as if they were looking into the tube of a telescope. Suddenly, at a signal from the furnace-man, the bands of workmen, to the number of about sixty, arranged themselves on each side of the furnace, as near to it as they could bear the heat. Then the doors were open to their fullest extent, and what had been a glare before, and what had been a heat, were quite eclipsed by the intense light and fervency with which the long tongues of flame leaped forth. In the midst of this great light lay a mass even whiter than the rest. To this some half dozen men drew near. They were all attired in thin steel leggings, aprons of steel, and a thin curtain of steel wirework dropping over their faces, like a large long visor. All the rest of their bodies were muffled in thick wet sacking. Thus protected, they managed, with the aid of a gigantic pair of forceps slung from a crane above, to work, as it were, amid the flames for a few seconds, and to nip the huge plate with the forceps. The signal was then given, and the whole mass of iron, fizzing, sparkling, and shooting out jets of lambent flame, was, by the main force of chains attached to the steam rollers, drawn forth from the furnace on to a long, wrought-iron car. The heat and light

which it then diffused were almost unbearable in any part of the huge mill, but the men seemed to vie with each other to approach and detach the colossal pincers which had drawn the iron forth. More than a dozen attempts were made during the day before this was effected, and more than a dozen of the best and most skillful workmen were driven back one after another, by the tremendous heat and glare. At last, all was made clear. The forceps, then red-hot from their grip of the plate, were drawn away, the chains cleared from the rollers, and, with a great hurrah, the other workmen seized the chains attached to the iron truck, and drew it to the incline by main force, where it was left by its own weight to run into the jaws of the rolling-mill. It was then *sauve qui peut* among the workmen, who rushed for shelter in all directions as the mass was nipped between the rollers, and wound rapidly in, amid quick reports like those of dull musketry, as the melted iron was squeezed by the tremendous pressure out of the mass, and flew out in jets of liquid fire on all sides. In spite of all the care and all the skill which the best workmen can use on these occasions, they cannot always escape the splashes of melted iron, and the burns inflicted are numerous and often severe. The turning of the rollers crushes the plate through to the other side, where it rests for a minute on a wrought-iron truck, similar to that on which it was brought from the furnace. The action of the rollers is then reversed, after they have been by the action of screw levers brought closer together by about an inch. These again nip the plate, and drag it back in an opposite direction, and again and again does the mass go forward and backwards, each time passing between a smaller space between the rollers, till the whole of the huge thickness was reduced to a compact mass, fifteen inches thick, in less than a quarter of an hour.

"During every stage of the process, quantities of fine sand are thrown upon the plate, and this literally takes fire as it touches the flaming surface, and covers it as it melts with a coat of silica, or with a glaze like that of earthenware. After every discharge of sand—and these go on almost incessantly—buckets of water are thrown upon the plate, and explode in clouds of scalding steam; and when these are partly dissipated, men rush forward, and with wet besoms, with handles twenty feet long, sweep off whatever little scraps of oxidation may have taken place. Thus, every time the plate passes through the mill, the sand is scattered, the water thrown, and the surface swept, and at every roll the chief roller of the establishment runs forward, and, under the shelter of wet cloths, measures with a gauge its thickness from end to end. On the day of our visit, the required dimensions were obtained, as we have said, by less than a quarter of an hour's rolling, and a plate fifteen inches thick, the product of the labor of nearly two hundred men, and of the consumption of nearly two hundred and fifty tons of coal, was shot out by the rolling-mills and left to cool. When this had been effected, two large rollers of iron, each weighing fifteen tons, were placed upon it by the cranes, and moved slowly backwards and forwards, and eventually, as the plate cooled, were left upon its ends, to keep the whole perfectly level. Nothing further now remained, in order to complete it as the finest specimen of armor-plate manufacture ever attempted, but to plane off its rough ends and edges. The flat surfaces on either side, which form what is called the skin of the plate, are never interfered with, for the action of the steel rollers leaves them literally almost as smooth as plate glass."

MINING SUMMARY.

Colorado.

REVIEW OF MINING IN GILPIN AND CLEAR CREEK COUNTIES.

A contributor of the Colorado *Tribune* forwards the following notes on the present condition and future prospects of the gold and silver mines of Gilpin and Clear Creek counties, sections where he is personally acquainted: "In the early days of our settlements every man relied solely upon his good health and good luck to secure him a fortune. Our counties were self-sustaining. The gulches, riverbeds, and decomposed quartz yielded up abundance of the precious metals by the aid of the shovel and sluice, and sufficient hard quartz was found to give employment to the numerous mills. On the heels of this state of things came the period of wild (South Sea bubble) speculation. The two years that followed witnessed a degree of recklessness and extravagance that is without a parallel. The operations of the new companies were conducted on eastern money and by eastern experts whose sand soon run out, leaving our prosperous region in a deplorable condition. All our developed mines were in the hands of Eastern companies who acted dog in the manger—they would do nothing nor allow others to do, if in their power to prevent; they treated any and every person from Colorado with hatred. It was not until two years ago that a change was brought about—all credit to our old resident miners who knew where the disease was seated. They obtained permission from some of the companies, at exhorbitant terms, to occupy and work their mines, and thus they demonstrated the fact that previous failures were not chargeable to the mines, but to their own recklessness and inexperience in the business which they had undertaken. A number of these old companies have already resumed mining operations, and we know of several now that will resume in the spring. The cold weather of the present winter retarded operations, but with spring will come renewed activity never before witnessed.

"Robert Teats has secured a large working capital to enable him to vigorously work his Coaley and Gilpin mines the coming season. Dunagan & Eures are pushing the U. P. R. R. lode. C. S. Abbott is running the Dickinson mill on their ore, and they claim to be able to keep several mills in constant operation from that lode, and are only waiting for a reduction of wages to push things. The Consolidated Gregory and New York mills are pounding away on the ore from the Gregory and Nevada. The Black Hawk Co.'s mills are running on ore from the same places. The Fitzpatrick mill is running Nevada ore. Stevens Bros. are putting new machinery into the Stanton building. Kimber & Co.'s mill is running Nevada ore. The Bates, Holman, Hurd, Empire and Chicago mills are doing custom work. Bobtail, University, Holbrook and Miley mills are working Nevada ores. The Sensenderfer mill is running Bobtail ore. Prof. Hill is getting a full supply of smelting ores, and will soon have a lead furnace in operation. Cash & Co. are erecting works for the treatment of ore by the leaching process—so successful in California—and will soon be in market to bid against Hill on first-class ore. Their works are in Chase gulch, quite as convenient to Nevada as Hill's works. With this competition the miners will get better prices for their ores. Among the mines now worked successfully in and about Gregory district we mention the Bates, which is turning out fine ore, Hunter, Dallas, Glenan, Gregory Second, and Gaston. These lodes were almost entirely abandoned for several years. A partial consolidation of interests on the Bobtail has been effected, and a general consolidation is expected. This is important in order to secure drainage. Mr. Rogers is working, and occasionally finds a paying pocket above water level. On the Gregory, the claims of the Consolidated Gregory, managed by Wm. Nichols, are doing well. The Black Hawk Company's claims are paying; their pump has given them some trouble of late, and has caused some delay. The Briggs claims are producing a large amount of smelting ore. The Smith & Parmelee claims are also doing well. Several claims are being worked on the Foot & Simmons lode. In Lake gulch a number of lodes are being worked. The Winnebago mill has passed into the hands of Goodspeed & Barrett, and is running on custom ore. Mather's mill at Central is running steadily on custom ore. The mills in Eureka gulch run when they can get water. The mills at Nevada are idle for want of water. The lodes of Nevada district are doing well. The bulk of the ore crushed in Gilpin county is raised in this district. Among the lodes worked we mention the Jones, Prize, Burroughs, California, Gardner, Simons, Forks, Flacks, American Flag, and Kansas; on Quartz Hill, Illinois, Roderick Dhu and Alps. In Russell district, Mr. Perrin is working the Pewabic, and several other parties are doing some mining. Some mining is also being done in Virginia cañon. In Clear Creek county mining operations are assuming extensive dimensions. A large army of miners are operating in Gilson guch. The Franklin Company's furnace is turning out silver bullion from the lodes in that neighborhood. The Womack party are working the Seaton lode and selling the ore to Prof. Hill. Idaho is looking up, and is being made attractive to the pleasure seekers.

"The Chicago Creek silver mines are nearly abandoned for the winter, but operations will be resumed and vigorously pushed in the Spring. In Hukill's gulch the Fairmount company's arastras are running on ore from the Schafter, Hukill and Edgar lodes. On Spanish Bar the Whale company is building a dam to turn the water into its flume, preparatory to running its mill. On Tail Creek the Colvin company is working the Phelan lode and trying to run its mill. Dr. Holland is mining and experimenting. Prof. J. Alden Smith is testing the ores of the district, preparatory to erecting a furnace in the neighborhood. On Fall River an English company is opening some silver mines and propose erecting smelting works in the spring. A wagon road is projected to cross the divide, connecting Nevada and Russell with the mill and water power on Fall River. This enterprise will afford cheap crushing facilities to those districts. In Spring or Golconda gulch, Mr. Grey is running a tunnel to cut the Smith lode. It is now in 90 feet. At Mill City considerable silver ore is being taken out, but the miners are awaiting Hagan's movements, who is expected back soon and will commence running his furnace. At Empire several Lightning processes are running, with conflicting reports as to their success. The mines have not been worked as extensively or yielded as well for years as at present. The Silver Mountain, Tenth Legion, Rosecrans, Conqueror and other lodes are being worked successfully. Every available quartz mill in the district is being run on gold ore. Mr. Merrill is trying to prospect the bed-rock of the gulch between the upper and lower town, and is now down twenty-five feet with no show of bed rock. The enterprise has frequently been attempted before. On Clear Creek above Empire, two parties are developing silver mines; still further up and above timber line, Capt. Lights' company is running a tunnel on the Pittsburg and Boston lodes, in Daily district. They have no connection with the outer world except by snow shoes. At Swansea, four miles below Georgetown, Capt Collum has erected reverberatory and smelting furnaces for the ores of that neighborhood. At Georgetown the Wilson & Cass company's dressing works are running on ore from the Griffith lode—the dressed ore being shipped to Newark N. J. Prof. Stewart has the foundation for his smelting works nearly ready for his buildings. They will be in operation soon. Their capacity will be thirty tons a day. It is rumored that the old Georgetown smelting works will be again started in the spring. The German works have been busy during the winter on ore from the Equator lode. The Brown company's smelting works never get cold. They have produced over one ton of silver bullion since they commenced—the Brown, U. S. Coin and other lodes in the vicinity furnishing the ore. Several hundred miners are employed on the mountains surrounding Georgetown, in raising and piling up ore, which will be packed to the reduction works as soon as the snow will permit. The Baker company has a full force of men raising and piling up ore. At East Argentine Professor Dibbin has erected a revolving cylinder, and has already made two shipments of silver bullion. From general observations throughout the two counties, one must come to the conclusion that our future is a bright one, and the coming Summer will witness a healthy and growing prosperity never before enjoyed here."

GOLD SHIPMENT.

The Central City *Herald* publishes a statement of bullion shipped in February, showing a gratifying increase on the production for the same month last year. It says: "The currency value of gold having fallen so considerably, whilst currency value for supplies and labor are still maintained, makes the increase of bullion somewhat of a surprise to our operators. The impression, on account of this depreciation of gold in currency value, had got abroad that the production of gold had been greatly reduced. These figures will disabuse the public of an impression not founded on fact:

	Currency.	Coin.
Warren Hussey	$57,000	$48,000
J. B. Chaffee & Co.	36,000	30,775
R. M. National Bank	34,000	28,000
Total	$127,000	$106,775

Compared with the corresponding month of last year:

	Coin.
February, 1869	$85,000
February, 1870	106,775
Increase	$21,775

PROSPECTING WITH THE DIAMOND DRILLS.

The *Herald*, March 5, says: "The Bullion consolidated and Incas Silver Mining Companies, have been making a test hole with the diamond drill, in the mountain, to prove the value of their property. We have alluded to their work on a previous occasion, but yesterday we had the pleasure of meeting Mr. N. W. Robinson, the agent who has been managing the work. From him we get a better idea of what has been done. The hole was started in the end of a tunnel 650 feet long, and has been driven 417½ feet. The farthest vein, and the main lode owned by the company, is 800 feet from the end of the tunnel. Another vein is 600 feet distant. Work is for the present suspended for want of fuel, the snow being so deep that it is impossible to get fuel to the works. To drive the tunnel to the main vein, a distance of 1,450 feet, would cost $72,500 at least. To bore the testing hole will cost $17,000—and when it is completed, they will know pretty definitely what they have got to work for, and whether it will pay to spend the money necessary for driving the tunnel.

"It has been suggested that a hole of this kind might be made available for draining the Bob Tail mine. The distance from the end of the Bob Tail tunnel to the vein, is about 800 feet. The work could be completed in a short time. We understand that the managers of the Bob Tail property have the subject under serious consideration, and may possibly make the experiment. We believe it would be successful, and, if so, would be a great saving of money."

Pennsylvania.

The Philadelphia *Ledger*, March 21, has the following remarks on the coal trade: "The anthracite coal trade is still in a very unsettled condition, though several meetings of the parties in interest have been held during the past week to harmonize differences, but we are sorry to say without any satisfactory result. A convention of coal operators, representing over four and a half million of tons, was held in Pottsville on Tuesday, and agreed on the following basis: With coal at $2 50 per ton at Port Carbon, outside wages, $9, inside, $10, miners, $12 per week; contract work reduced 30 per cent. Advances 20 per cent. as heretofore. The last year's basis was $3 as the minimum, and outside wages in proportion. On these prices a number of miners had resumed work. On Thursday the Council representing the miners met at Summit Hill, and rejected the basis of $2 50 per ton proposed by the operators at their convention in Pottsville, the Tuesday previous, decided to adhere to the basis of 1866, which is $3 at Port Carbon and $5 at Elizabethport. The only plan now seems to be for the miners of Columbia and Schuylkill counties to cut loose from the other counties and fix their own basis and wages. The general impression is that the Schuylkill miners will stop work on the 2d of April. The operators are more united than ever before in times of trouble of this character, and the belief among them is that the resistance of the demands for wages will be unanimously resisted. Coal prices of last year cannot be maintained, nor can operators afford to sell coal at the market price and pay miners what is insisted on. Unless a compromise can be effected within the remaining time of this month suspension seems inevitable in the Schuylkill region. It is reported that the Reading Railroad Company, which has reduced its last year's toll charges most liberally, in order to keep the Scuylkill region in full operation, has proffered a willingness to deliver coal to large consumers on its line from other regions, thus keeping up a supply. In face of operations of this character, the miners appear to be pursuing a very inconsiderate course, and one in which they will be the severest sufferers. The trade was a good deal interrupted last week by a fall of about two feet of snow. The mines and breakers were choked-up, and the lateral roads in some places considerably obstructed. In consequence of this the market has been steady, with a slight advance in prices, and there has been an evident indisposition manifested on the part of holders to sell at the present rates. The Reading Railroad Company brought down of all kinds for the week ending on the 17th inst., 44,292 tons, against 14,987 tons the previous week, and for the fiscal year, beginning December 1st, 72,405 tons, against 612,387 tons to corresponding time last year—an increase of 3,019 tons. The total product of all the anthracite regions for the week, as far as reported by the several carrying companies, was 167,284 tons against 149,802 tons the previous week—an increase of 17,482 tons—and for the fiscal year 2,369,161 tons against 2,018,571 tons to the same dates last year—showing an increase of 315,597 tons. Prices of coal by the cargo at Port Richmond, for shipment east of Bordentown and south of Cape Henry, are as follows: Schuylkill red ash, $4 20@4 50, broken $4, egg $4, stove $4 10@4 25, and chesnut $3 75. Shenandoah broken, $4 10, egg $4 10, stove $4 25, and chesnut $3 80. To other points the rates are 40 cents per ton higher than the above quotations. In other words the near market pays the 40 cents per ton higher prices than the more distant market. Serves the near market right. What business has it to be near the coal mines? The following were the current rates of freight from Port Richmond for the week ending March 18: To Boston $2 75@3, Charlestown $2 75, Cambridge $3 10, Fall River $2, New Bedford $2, Salem $3, Newport $2 10, Providence $1 90@2, Norwich $1 90 and tow, New Haven $1 75, Stonington $2, New York $1 25, Troy $1 75, Williamsburg $1 25, Annapolis $1 10, Washington $1 25, and Wilmington, N. C., $1 25. That is a queer movement reported of the Committee of Ways and Means in Congress, last week, namely, that it had determined to admit anthracite coal free. When it is remembered that there is no anthracite coal in Nova Scotia, nor we believe anywhere else but the United States, a facetious cotemporary thinks it must be considered 'one of those mysteries of legislative Bunsbyisms only to be appreciated within the halls of Congress.' China might, with as much reason, proclaim the free importation of pigtails, and Russia of icebergs."

California.

GOLD EXCITEMENT IN SOUTHERN CALIFORNIA.

There is great excitement in the extreme southern counties over the discovery of new rich gold fields, about sixty miles from San Diego. The quartz exhibited is said to be free from sulphurets and other metals, and literally full of free gold. People are leaving San Diego and Los Angelos in large numbers for the new mines. A telegram from San Francisco, March 14, says: "The rush to the San Diego gold mines is unabated. The stages that make the trip overland are crowded daily. The steamer yesterday carried about four hundred gold-seekers. Another steamer with passengers for the same destination will leave here to-morrow. It is reported that the Chinamen have been driven out of the new mines and several of them killed. San Diego and other towns in the southern portion of the State are being rapidly depopulated."

Mexico.

A correspondent of the San Francisco *Bulletin*, writing from Colima, Feb. 19, says: "The only industry which is actually flourishing in Mexico is mining. A company has been formed at London to work the gold mines of Coyuca and the mining district of Guadaloupe de los Reyes, news which was celebrated at said points with *vivas* and the firing of cannons. From Jaica de Ledesina we hear that two companies are exploring the rich deposits, and in other parts of the country equally important discoveries have been made. In Moretos, the gangs of Romo, Abraham and Juan Garcia had attacked the mineral of Tasco, but we have since been informed that they were overtaken by Col. Francisco Simon and eight of their number killed. If it was not for the energy shown by the inhabitants of many Mexican villages and towns, the pest of bandits would be much greater than it actually is."

MARKET REVIEW.

The Coal Trade.

NEW YORK, March 25, 1870.

Trade at the present time is brisk. The demand is unusually good and prices well sustained, and even advanced, though we do not note any changes in our quotations. The amount of coal in the market is small, and some kinds are hardly to be obtained at any figure; the supply of stove coals is very limited. We understand that the Morris Canal will open on Monday, the 27th. Shipments have already commenced from Trenton.

The miners in the Schuylkill regions have refused to work upon the basis of $2 50, as proposd at the operators' meeting, and it is doubtful whether the operators will continue work after April 2d at the present rate of $3.

The regular monthly sale of Scranton coal will take place on March 30th, at which time 80,000 tons of the various sizes will be sold on the usual terms. In consequence of the scarcity of coal at the present time, prices at this sale will probably advance, which may have the effect to keep the Schuylkill region at work by an advance in the prices at Mauch Chunk, in which it is quite probable that a glut in the market will be the result, which in turn will delay the final adjustment of existing difficulties for a month or more.

Philadelphia advices report the market unchanged. The opinion there is that work at the mines will stop on the 4th of April. Little coal is being shipped, dealers not seeking orders on account of the uncertainty of the supply.

RETAIL.—In the retail trade we note a very good demand, but with unchanged prices.

Anthracite Coal Trade for 1869 and 1870.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending March 19, 1870, compared with week ending March 20, 1869.

COMPANIES.	1869. WEEK.	1869. TOTAL.	1870. WEEK.	1870. TOTAL.
*Cata. & Reading R.R	61,872	622,742	14,141	5 3,011
Lehigh Canals				
Lehigh Valley R. R.	38,842	612,963	34,82-	750,0?4
Lehigh and Sus. R. R.	16,..79	189,670	16,122	183,9?8
†Lehigh Canal				
Scranton North	9,119	108,133	6,765	12?,1?5
" South	27,367	321,3.7	25 0 6	3?2 8-6
Penn. Coal Co., rail	2,708	149,920	11,791	187,5.3
" " canal				
Del. and Hudson, rail, N.			8,230	121,232
" " " south			5,16.	31,762
Delaware & Hud. Can. N				
" " S.				
Shamokin	5,532	70,7?8	3,758	55,5?7
Treyorton	8.8	4.3 6	414	3,733
Lykens Valley Coal Co.	1,?19	8,?21		
†Wyoming South				
" North				
P. N. Y. C. & R. R. Co.			1,945	63,754
Williamstown, Coal'y	3,82.	22,612	4,7..	44,5?1
Short Mountain	1,?29	8 9 1		
Total	179,417	2,123,1?3	132,848	2,49?,126
1870	152,848			2 123 1 3
Decrease week and year	16,56.		Incr'se	369,0?3

* Less coal transported for Company's use and Bituminous coal

† Closed for the Season.

Bituminous Coal Trade, 1869 and 1870.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending March 19, 1870, compared with week ending March 20, 1869.

COMPANIES.	1869. Week.	1869. Year.	1870. Week.	1870. Year.
B. & O. R. R.				
C. & O. Canal				
H. & B. T. R. R.	6,270	63,265	4,994	46,992
Harrisburg & D.			7,857	103,029
L. V. R. R.		552		3,316
P. & N.Y. C. & R. Co.			1 858	44,559
	6,270	63 757	14,739	197,890

Schuylkill Coal Trade.

Report of Coal transported via the P. and R. R. for the week ending March 19, 1870—less coal carried for company's use, and Bituminous Coal:

For week	34,141 09
Previously this year	548,870 09
Total	583 011 18
Same time last year	622,742 00
Decrease	39,731 00
Amount sent same week 1869	61 872 00

Report of coal transported on the Philadelphia and Reading Railroad for the week ending Thursday, March 17, 1870:

From St Clair	15,933 18
" Port Carbon	3,957 03
" Pottsville	9 10
" Schuylkill Haven	6,402 03
" Auburn	1,731 12
" Port Clinton	5,682 10
" Allentown and Albartis	359 13
" Harrisburgh and Dauphin	7,886 14
Total paying freight	42,128 03
Coal for Company's use	2 264 10
Total for week	44,292 13
To same time last year	616,475 19
Total	720.3 8 12
To same time last year	659,625 06

Harrisburgh and Dauphin Coal Trade.

The following is the amount of Bituminous Coal transported via the P. and R. R. for the week ending March 17, 1870:

	Tons.
For week	7,986 14
Previously this year	95,142 00
Total	103,028 14

Report of Coal Transported over Lehigh and Susquehanna Railroad.

Week ending March 19, 1870—Compared with same time last year.

WHERE SHIPPED FROM	WEEK, 1870. tons ct	WEEK, 1869. tons ct	YEAR, 1870. tons cwt.	YEAR, 1869. tons cwt.
Wyoming Region	14462 15	10233 18	143722 1	1072?-5 13
Upper Lehigh Region	1346 18	2746 18	?8.2 16	34391 0.
Hazleton Region	313 01	265 06	1743 06	160? 13
Mauch Chunk Region		3114 03	30689 18	46 86 14
Totals	16122 05	16379 03	183908 12	189670 03
Increase				
Decrease	257 01		5731 11	
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	11237 15	15039 03	161938 09	171115 13
Delivered at and above Mauch Chunk	360 18	726 06	7264 02	7651 19
Delivered to L. & B. R. R. at Plymouth Bridge	4423 12	535 19	14646 01	6004 10
L. V. R. R. at Sugar N.		56 18		4-98 01
Totals	16122 05	16 79 05	183908 12	18.670 03
Of the above there was from Company's Mines,	827 04	3114 03	38979 15	46?86 14
Increase				
Decrease	2286 19		7406 19	

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company, for week ending Saturday, March 19, 1870.

	WEEK.	SEASON.
North	25 502 10	439,884 03
South	5 165 02	37 762 11
Total	30,667 12	477,646 14
Corresponding time in 1869.		
North	24,215 05	392,939 04
South	1,8 4 12	17,096 09
Total	36 092 17	410,035 3
De rease North	8,712 15	Increase 4?,944 19
Increase South	3,2?0 10	Increase 20,666 02
Total Decrease	5,432 05	Increase 67,611 01

Penn. and N. Y. Canal and Railroad Co.

REPORT of Coal Transported via the Pennsylvania and New York Canal and Railroad Company, for week ending March 19, 1870:

	WEEK.	PREVIOUSLY.	TOTAL.
Anthracite	1,844 18	61,909 06	63,754 04
Bituminous	1 858 00	42,701 00	44,559 00
Total, Ant. and Bit.	3,702 18	104,610 16	108,313 04

Report of Coal Transported over Lehigh Valley Railroad

For the week ending March 19, 1870, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	PREVL'Y. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	8,550 01	152,440 16	160,990 17
" Hazleton	18,738 12	3?0,722 01	389,460 13
" Upper Lehigh	22 11	520 05	542 16
" Beaver Meadow	5,671 17	119,8?9 19	125,521 16
" Mahanoy	1,?45 13	71,?74 09	73,120 02
" Mauch Chunk		447 17	447 17
Total Anthracite	34,828 14	715,265 07	750,094 01
Bituminous Coal recv'd from Cata. R. R.			
N. C. R. R.			
E. P. R. R.		3,310 00	3,310 00
P. & N. Y. C. & R.R. Co			
Fall Creek			
Schroeder			
Towanda			
Total by rail and canal	34,828 14	718,575 07	753,404 01
Same time last year	3?,842 00	574,093 15	612,?35 15
Increase		144,493 12	140,?69 06
Decrease	4,013 06		
Forwarded East from M'h Chunk by rail	22,110 15	631,390 07	663,501 02
Same time last year	36,107 13	543,4?3 07	5?9,587 00
Increase		87,911 00	?3,914 02
Decrease	3,996 18		

RECAPITULATION.

Forwarded East from M'h Chunk by rail	32,110 15	631,390 07	663,501 02
To N. C. R. R., at Mount Carmel		115 00	115 00
Forwarded North from L. & B. Junction	1,844 18	61,531 01	63,375 19
To L. & S. R. R. at Packerton for rail	141 14	2,053 01	2,194 15
Delivered at M'h Chunk	27 11	347 15	375 06
Delivered on line of road above Mauch Chunk	295 11	3,3?7 08	3,662 19
Delivered above M. Chunk for use of L. V. R.R.	403 03	15,865 06	16,213 11
To L. & S. R. R., at P'n Hav., for railroad			
Do for canal			
At M. Chunk for canal		655 09	655 09
Total Anthracite	34,8.8 14	715,?66 07	750,094 01
Bituminous Coal		3,310 00	3,310 00
Total all kinds	34,8.8 14	718,?75 07	753,404 01

Freights.—MARCH, 1870.

TO EASTERN PORTS.	From Philada'a.	From E. Portand Port Johnston.	From Newbury.	From Rondout.
Amesbury	$3 25	$— —	$	$
Bangor	3 00	— —	2 25	
Bath	2 ?5	2 00		
Boston	2 75	2 00		
Bridgeport	1 ?5	1 00	1 20	
Bristol	2 00	1 40	1 45	
Cambridgeport	3 00	2 00		
Derby	2 00	— —		
Dighton	— —	— —	1 50	
East Cambridge	3 00	2 00	2 40	
Fall River	2 00	1 40	1 45	
Hackensack	1 95	1 50		
Hartford	2 75	1 50		
Jersey City	1 75	50		
Middletown	— —	1 25		
Mystic	2 00	1 40	1 35	
New Bedford	2 25	1 40		
Newburyport	3 10	2 00	2 25	
New Haven	1 80	1 00	1 20	
New London	2 00	1 25	1 30	
Newport	2 00	1 40	1 45	
New York	1 25	50	60	
Norwalk	1 75	1 00	1 15	
Norwich and Tow	1 90	1 40	1 40	
Pawtucket	2 00	1 50	1 65	
Portland	2 50	2 00		
Portsmouth, N. H	3 35	2 15	2 20	
*Providence	2 00	1 40	1 50	
Rockport	— —			
Saco	3 00	2 25		
Sag Harbor	2 00	1 40	1 35	
Salem	3 00	2 00	2 15	
Stamford	2 00	1 00	1 10	
Stonington	2 00	1 40	1 30	
Taunton	3 10	2 00		
Warren	— —	1 50	1 53	
Washington	1 25			
TO RIVER PORTS.				
Albany		1 00	- 60	
Catskill		- -	- 50	
Cocksackie		- -	- 50	
Coeyman's		- -	- 75	
Cold Spring		- -	- 35	
Fishkill		- -	- 30	
Haverstraw		50	- 60	
Hudson		- -	- 50	
New York		- -	- -	
Nyack		50	- 60	
Poughkeepsie		- -	- 35	
Rhinebeck		- -	- 30	
Rondout		- -	- -	
Saugerties		- -	- 40	
Sing Sing		- -	- 60	
Stuyvesant		- -	- 55	
Tarrytown		80	- 75	
Troy		1 00	- 75	
West Point		— —	- 35	
Yonkers		40	- -	

Foreign and Provincial Freights.

March, 1870.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-3 tons ..... £13 10@£14

Liverpool ..... 13s.@15. ton

TO NEW YORK.

Provincial

Sidney $3 25

Lingan 3 25

Cow Bay ..... 3 ?5

Port Caledonia 3 25

Little Glace Bay 3 25

TO BOSTON.

Sydney $2 75

Lingan 3 75

Cow Bay 3 25

Port Caledonia 3 00

Little Glace Bay 2 25

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven	$2 00
From Port Carbon, 8 cents per ton more.	
Less drawback of 80 cents on all Coal shipped east of New Brunswick and south of Cape Henry.	
MAUCH CHUNK TO ELIZABETHPORT.	
L. V. Railroad from Mauch Chunk to Easton	$ 81
C. R. R., N. J., Easton to Elizabethport	1 12
Shipping expenses at Elizabethport	25
Warfage	10
Total	$2 28

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Easton	$ 81
C. R. R., of N. J., Easton to Pt. Johnson	1 19
Shipping expenses	25
Warfage	10
Total	$2 35

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ 81
Morris & Essex R. R. Easton to Hoboken	1 19
Shipping expenses	25
Warfage	10
Total	$2 35

TO SOUTH AMBOY.

L. V. R. R.	81
B. & D. R. R. / Cam. & Am. R. R.	1 09
Shipping Expenses,	25
Total	$2 15

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	96
C. RR. of N. J. Easton to Elizabethport	1 19
Shipping expenses	25
Wharfage	10
Total	$2 49

Prices of Coal by the Cargo,

[CORRECTED WEEKLY.]

	AT NEW YORK, March 25. R. A.	W. A.	AT PHILADELPHIA, March 24. R. A.	W. A.
SCHUYLKILL.				
Lump	$— —	$5 00	4 20	4 50
Steamer	— —	5 00	— —	— —
Broken	— —	5 00	— —	4 10 to — —
Egg	5 75 to 6 00	5 25	— —	4 10 to — —
Stove	— —to— —	5 50	— —	4 10 to 4 25
Chestnut	4 50 to — —	5 00	— —	3 75 to —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump	5 75	— —	— —	— —
Broken	5 50	— —	— —	— —
Egg	5 50	— —	— —	— —
Stove	5 75	— —	— —	— —
Chestnut	5 25	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Diamond Vein	R. A. 6 00	— —	— —	— —
New England	" — —	— —	— —	— —
Locust Dale	W. A. 5 75	— —	— —	— —
Honey Brook, Leh'h	W. A. 4 75 to 5 25	— —	— —	— —
Spring Mountain	" " 4 75 to 5 25	— —	— —	— —
Sugar Creek	" " 4 75 to 5 25	— —	— —	— —
Sugar Loaf	" " 4 75 to 5 25	— —	— —	— —
Old Comp'y's.	" " 4 75 to 5 25	— —	— —	— —
Cross Creek	" " 4 75 to 5 25	— —	— —	— —
Enterprise	" "	— —	— —	— —
Girardville	" "	— —	— —	— —
McMichael	" "	— —	— —	— —
Shamokin	" "	5 50	4 50	— —
Lykens Valley	" "	— —	— —	— —
Broad Top	" "	— —	4 00	— —
Hill & Harris	" "	— —	4 50	— —
Henry Clay	" "	— —	4 50	— —
Powelton	" "	— —	4 50	— —

Prices for Coal at Mauch Chunk.

	F.L.	Bro.	Gra.	Eg.	Sto.	Ches.
Lehigh	$3 00	$3 25	$3 25	$3 25	$3 75	$3 00
Wilkesbarre	3 00	3 25	3 25	3 25	3 75	3 00

For freight to Elizabethport and to New York see "Freights."

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein...f.o.b. at Phila.						$5 25
" " Lemon						5 00
Cumberland Vein Coal						5 00
Cumberland C. & I. Co.'s on board					N. Y.	7 5?
Central C. & M. Co.'s					"	7 50
Consolidated Coal Co.'s					"	7 50

[*Dealers in these coals may be found in our advertising columns.]

Company Coals.

	L.	Str.	Gra.	Eg.	Sto.	Ches.
Scranton at E. Port	— —	— —	— —	— —	— —	— —
Pittston at N. Y	— —	— —	— —	— —	— —	— —
Lackawana at Weh'kn.	— —	— —	— —	— —	— —	— —
Wilk'b're at Hoboken	4 75	4 75	4 75	4 75	5 25	4 50
Old Co. Lehigh at Pt. Johnston	5 50	5 00	5 00	5 00	5 25	4 50
Lehigh at E. Port	5 25	5 00	5 00	5 00	5 25	4 50

For freights to different points, see "Freights."

Prices of Foreign Coals.

March, 1870.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street, New York.

Liverpool Gas Caking	$ 9 50@— —
" Cannel	10 00@12 00
" House "	13 50@15 50
" " Orrel	13 00@15 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" " Cannel, "	18 00@20 00

Per ton 2,000 lbs., delivered

Prices of Gas Coals.

March, 1870.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 43 Pine st., N. Y.

Duty, $1 25.

	Coarse. Gold.	Slack. Gold.
Block House	$1 75	@— 75
Gowrie	1 75	@— 75
Lingan	1 75	@— 75
Sydney	2 13½	@— 71½
Pictou	2 13½	@1 18¾
Little Glace Bay	1 50	@1 00
Caledonia	1 50	@— 75

AMERICAN.

	Coarse. Currency.	Slack. Currency.
Westmoreland Co	— —	@— —
Despard Coal Co	$— —	@— —
Penn	— —	@— —
Newburg Orrel Gas	— —	@— —
West Fairmount Gas Coal	— —	@8 00

AT PHILADELPHIA.

Powelton	$7 80

Prices at Baltimore—March, 1870.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$6 60@6 75
Pittston and Plymouth	6 00@6 50
Shamokin Red or White Ash	6 00@6 25
Lykens Valley Red Ash	— —@6 50
Zerba Valley	6 00@6 25
Treverton, Red Ash	6 00@6 50
By retail, all kinds per ton of 2240 lbs.	7 25@8 50
Georges Creek & Cumberland f. o. b. at Locust Point for shipping	— —@5 00
West Fairmount Gas f. o. b.	6 00@6 50

Prices at George't'n, D.C., & Alexandria, Va.

March, 1870.

George's Creek and Cumberland f. o. b. for shipping $4 75

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$— —@— —
Lykens Valley	— —@— —
Shamokin Red or White Ash	— —@— —
Trevorton and Zerba Valley	— —@— —

METALS.

NEW YORK, March 12, 1870.

IRON.—Duty: Bars, 1 to 1½ cents ₱ lb; Railroad, 70 cents ₱ 100 lbs.; Boiler and Plate, 1½ cents ₱ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ₱ lb; Pig, 9 ₱ ton; Polished Sheet, 3 cents ₱ lb.

Pig, Scotch No. 1, ₱ ton	33 00@37 00
Pig, American, No. 1	33 00@35 —
Pig, American, No. 2	32 —@34 —
Pig, American, Forge	30 —@31 —
Bar, Refined, English and American	— —@78 00
Bar, Swedes, assorted sizes (gold)	85 00@97 50
Store Prices.	
Bar, Swedes, ord'y sizes, less 5 ₱ ct.	115 —@125 —
Bar, Refined	77 50@— —
Bar, Common	72 50@— —
Scroll	87 50@115 —
Ovals and half-round	95 —@— —
Band	95 —@— —
Horse Shoe	95 —@— —
Rods, ⅜ to 3-16 inch	85 —@120 —
Hoop	105 —@145 —
Nail rod, less 5 ₱ ct.	— 7 @—7¼
Sheet, Russia, as to Nos. (gold)	— 11—@—12—
Sheet, Single, D. and T. Common	— 4½@— 6½
Sheet, Galvanized	List 25@30 ₱ cent. discount.
Rails, English (gold), ₱ ton	58 00 @58 50
Rails, American, at Works in Pa.	76 00 @77 00

STEEL.—Duty: Bars and ingots, valued at 7 cents ₱ lb or under, 2½ cents; over 7 cents and not above 11, 3 cents ₱ lb; over 11 cents, 2½ cents ₱ lb, and 10 ₱ cent ad val. (Store prices.)

English Cast (2d and 1st quality) ₱ lb	— 16 @— 20
English Spring (2d and 1st quality)	— 7 @— 10
English Blister (2d and 1st quality)	— 11 @— 18
English Machinery	— 11½@— 14
English German (2d and 1st quality)	— 13 @— 15
American Blister "Black Diamond"	— — @— 12
American, Cast, Tool do.	— — @— 18
American, Spring, do.	— 9 @— 12
American Machinery, do.	— — @— 12
American German, do.	— 10 @— 12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20 cents ₱ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₱ lb	— @— 31
Copper Bolts	— @— 31
Copper Braziers, 16oz. and over	— @— 31
Copper Nails	38 @— —
Copper, Old Sheathing, &c., clean	17 @— 18
Copper, Chili Pig	— @— —
Copper, American Ingot	19 @— 19½
Yellow Metal, New Sheating	24 @— —
Yellow Metal Bolts	24 @— —
Yellow Metal Nails	— @— 24

LEAD.—Duty: Pig, $2 ₱ 100 lbs.; old Lead, 1½ cents ₱ lb; Pipe and Sheet, 2½ cents ₱ lb.

Galena, ₱ 100 lbs	$— — @— —
Spanish (gold)	6 15 @6 20
German, do.	6 15 @6 37½
English, do.	6 20 @6 62½
Bar — (net)	@ 7 75
Pipe and Sheet (net)	— — @ 7 75

TIN.—Duty: Pig, Bars, and Blocks, 15 ₱ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₱ cent. ad val.

	Gold ₱ lb.
Banca	33½@34
Straits	32½@—
English	30 @31½

PLATES.

	Four to Good Brands. Gold.	Currency.
I. C. Charcoal, ₱ box	$8 25 @8 50	$9 75 @10 00
I. C. Coke	7 00 @7 50	8 25 @ 9 00
Coke Terne	5 75 @6 00	6 75 @ 7 —
Charcoal Terne	7 87½@8 00	8 75 @ 9 50

SPELTER.—Duty: In Pigs, Bars, and Plates, $1 50 ₱ 100 lb.

	Gold.
Plates, Foreign ₱ 100 lbs.	$6 00 @6 12½
Plates, Domestic ₱ lb.	10 @— 11½

REMARKS.

IRON.—The demand for both Scotch and American continues light, but as there is no disposition evinced to press sales, prices are supported. We notice 50 tons Glengarnock at ₤34; 70 do. No. 1 Thomas, ₤34; and 50 do. Lehigh Gray Forge, equal to $29 50 at the furnace. There is a good inquiry for Wrought Scrap, and sales have been made of 300 tons No. 1, from yard, on private terms. The demand for Rails continues without abatement, and prices are steady at the advance previously noted; the sales are 1,600 tons 56 lb. English at $58 @ $58 50, gold; 750 do. old Double-headed, and 100 do. old T, on private terms. Bar continues exceedingly dull, and prices are again lower, though it is predicted this time that the bottom has been reached. At present cost of importation (with the increased duty, etc.,) the margin is much smaller now than in 1869, though the gold price for Refined from store then was about $57 50, against gold price now say of $69 19—duty then $9 40; duty now for same sizes $28 per ton. We now quote store prices, net cash: Bar, Swedes, ordinary sizes, $115 @ $125; Bar, Refined, $77 50; Bar, Common, $12 50; Scroll, $87 50 @ $115; Ovals and Half-round, $95 @ $110; Band, $95; Horse Shoe, $95; Rods, ⅜ @ 3-16 inch, $85 @ $120; Hoop, $105 @ $145; and Nail Rod, 7 @ 7¼ cents per lb.

LEAD.—The market for Pig is dull, and the business has been confined to small jobbing lots of ordinary Foreign at $6 25, gold; 25 tons Spanish sold at a private price. Bar, Pipe and Sheet are steady at 7¾ cents, net cash, as last reported.

COPPER.—The manufactures of Copper and Yellow Metal are steady at our quotations. The demand for Ingot is very light, but the market is scarcely as depressed as it has been, and there is a more cheerful feeling with, for small lots, a little hardening in prices; the sales are 40,000 lb. Lake Superior, in lots, at 19¼ cents, and 25,000 lb. Tennessee, 19¼ cents, cash.

TIN.—Pig is in very limited demand, and we have only to notice the sale of five tons English at a private price. We quote: Straits, 32¼ @ 32½ cents; Banca, 34; and English 31½. Plates are steady, though there is only a moderate business; 500 bxs. Assorted Charcoal Tin sold at $8 31½ @ $8 37½, and 100 do. Charcoal Terne $7 50, gold.

SPELTER.—The market is exceedingly dull, and prices remain nominal at 6 @ 6½ cents, gold.

ZINC.—American Ox. Zinc, 6½ @ 7c.; French do., 10 @ 10½c.; Sheet Zinc, 9½ @ 10½c.

MANGANESE—Ox. Manganese, 4½ @ 5c. per lb.

Mining Stocks.

NEW YORK, March 25, 1870.

There is unusual activity in the mining share market, and prices have advanced. Black Hawk is most noted in this particular, sales having been made yesterday at 60 cents. Sales were made also of Smith & Parmelee at $1 45; Grass Valley, s. 3, at 24c., and Quartz Hill, 360, at 55c. Reference to our list of quotations elsewhere will show other important advances.

Petroleum stocks, as a whole, continue in their downward course. Sales of Central were made yesterday at 56c., and Home is now quoted at $3. The following is the latest report of the Stock Board:

	Bid.	Asked.
Bennehoff	30	35
Bergen Coal and Oil	40	—
Bliven Oil	26	—
Brevoort	—	—
Buchanan Farm	38	45
Central	55	59
Home Petroleum	3 00	—
National	50	—
N. Y. and Alleghany	1 50	—
Northern Light	75	1 00
Pithole Creek	1 25	—
Rathbone	25	—
Rynd Farm	31	32
Second National	50	75
Tarr Farm	—	—
United Petroleum Farms	26	35
United States	70	—

San Francisco Stock Market.

We find it impossible to get any late telegraphic quotations of Nevada and California Mining Stocks. The recent advances make the authorities reticent. The latest report dates from the Bank of California, March 12, and states that rich and important developments have been made in the Gould & Curry mine; price of stock, $260. A dspatch to the Associated Press of same date quotes it at $365. How is this?

Road Steamers.

In a recent number of the London *Times* we find a very interesting account of the progress made in the application of steam to locomotives for common roads. The subject is as important as it is interesting; and, if all that is claimed for the new steamer is true, it should rather be called a steamer for "uncommon roads." Indeed, no road at all seems to be necessary, for this iron horse appears to run with equal ease over stone heaps, sand banks, grass fields, snow, ice, ploughed land, and any other of the ordinary inequalities of the earth's surface in rural districts. It goes up hill and down, over gradients of one foot in eight, by actual test. The main difficulties, hitherto, have been that the roughness of bad roads, or of good roads out of repair, caused continued breakage in the machinery. If the strength of the machinery was increased it added to the weight, and then the road was cut up. Claws were contrived upon the wheels to dig the machine out of soft places, and to keep it from slipping back while going up hill. But these expedients only made the road steamer a huge ploughing machine, destroying the road as it moved, and not only rendering it impassable for other vehicles, but making the way impracticable after a while for the steam engine itself. Another contrivance was a cumbrous system of planks or portable railway, carried with the machine, which revolved with the wheel, for it to run upon. The longer the experience in these contrivances, the less hope there appeared to be of any general or practical success.

The new road steamer here referred to was invented by R. W. Thompson, civil engineer, of Edinburgh, and has, in the first place, the advantage of lightness. A steamer with a ten-horse engine weighs about eight tons; a six-horse, six tons. Three-horse engines have also been built, and there seems to be no reason why even lighter ones cannot be constructed, such as steam sulkies for country doctors and mail carriers. The new road steamer runs on three wheels, two large behind, and a smaller one in front. And now we come to what appears to be the main element of success in the invention. The wheels, which are of great width, are surrounded by tires of vulcanized India rubber. These thick bands of rubber enable the steamer to roll over the surface of the ground without the slightest damage to the road, while they likewise protect the machinery from all concussion. The intervention of the elastic tires between the wheel and the road acts, in fact, in the same way as if the engine were running over a tramway of India rubber.

The India-rubber tires for a ten-horse engine weigh 14 cwt. These tires are guarded by flexible shields, formed of open steel bars, which give an excellent "bite" or hold upon the ground. While these bars do not in any way interfere with the elastic play of the rubber, they save it from wear. Over ice and snow, and over sand, as in Egypt, the steel shields are dispensed with. These tires have been compared to the elephant's foot, with its soft and yielding pad. Bits of coal, potatoes, and other substances have been thrown down in the way of the steamer, and picked up, uncrushed, after the wheel has passed over them. The cost of the new steamer is not given in exact figures, but is much less than that of the old-fashioned locomotive, and the amount of fuel required is less. Of the practical use of the invention, the following facts will give an idea:

A road steamer of six-horse power which belongs to the owner of some very extensive flour mills, has been running for seven months between Aberdeen and the mills. The distance each way is three miles, and this it accomplishes in an hour. At first it performed four trips a day, but latterly it has been making six, taking a load of ten tons each time. The road over which it travels is perhaps the worst bit of road in Scotland, being narrow and tortuous, and the gradients for one-half of it varying from 1 in 9 to 1 in 8. Up this incline of 1 in 8 the road steamer, which weighs six tons, takes in tow a load of ten tons. This engine has already run over 2,500 miles, and has carried nearly 8,000 tons, running six times daily through the chief streets of a busy city. A three-horse power engine drew a boiler weighing thirteen tons up an incline of 1 in 12, the ground being so slippery at the time from frost that horses could not keep their feet. The engine was run through a grass field without leaving a track and again through a field, covered to the depth of two feet with loose earth. A ten-horse power engine, weighing eight tons, ran with four wagons attached to it out to a colliery twelve miles from Edinburgh; there received a load amounting, with the four wagons, to 32 tons, making the weight of the whole 40 tons; and then returned up inclines of 1 in 16 to Edinburgh. It wended its way, with its train of 90 feet, with perfect facility through the narrow streets of the old town, which chanced on the occasion to be thronged with vehicles carrying people to some open-air festivity. It turned all manner of sharp corners, ran down the steep hill to Leith, entered a lane, and drove in through the gates of the factory, where it delivered its load. A ten-horse power engine, drawing a load of 17 tons of pig-iron, was driven along the Granton road at the rate of eight miles an hour. The same engine was run along the sea sands through the loose, dry sand, over the soft wet sand, and even through a creek of running water, with as much ease as if it had been driving along a turnpike road.

For military purposes, it is found that the road-steamer is a good pioneer, making a road for the train of artillery behind it. Already a trial steamer ordered by the Indian Government, is on its way to Calcutta. If these India rubber tires do all that is expected of them, their introduction is a matter of great consequence, and a new field for agriculture will be opened in the careful cultivation of the trees which produce the invaluable sap, now obtained by wasteful tapping of the trees in the natural forest. For agricultural purposes we need hardly say this invention promises much. Steam-ploughing by stationery engines has been only exceptionally useful, and on level lands. The new locomotive runs up hill-sides of any ordinary slope. As feeders for railroads the common road-steamer promises to add a large increase to their merchandize traffic, and open up new regions of country now out of railroad reach.

Here is a rare opportunity for the versatile ingenuity of American inventors and mechanics. Usually those practically useful inventions originate in the United States, and are then taken and improved by England, France or Germany. Now, let our mechanics and inventors take this India rubber-tired machine and adapt it to the propulsion and working of ploughs and all agricultural machinery, and for teaming on our poorly constructed country roads between railway stations and factories and mills. It can be made to be second in importance and value only to the locomotive and the railway itself.—*Phil. Ledger.*

Influence of Heat and Cold on Lighting Gas.

THE *Journal für Gasbeleuchtung* gives an account of experiments which have been made in the laboratory of the University of Munich. It is well know that the illuminating power of gas diminishes when its temperature is reduced, as may be seen by the inferior light which street lamps give in winter. In the experiments of which we are going to speak, in order to reduce the gas to a low temperature, it was made to pass through a tube in the form of the letter U, which was placed in snow or a refrigeratory mixture. On issuing from this tube, it entered a burner made of steatite, so that it was ignited immediately after being cooled. To measure the illuminating power Bunsen's photometer was used, the construction of which is well known. The temperature of the room in which the experiments were made, 18°, was taken for the normal temperature, and the illuminating power of the gas in those conditions was called one hundred. The first experiment, then, was to make gas having no normal temperature, pass through the U-tube, and to estimate its illuminating power; then to plunge the tube in water at 0°, and finally into a mixture of snow and salt at a temperature of 20°. The tube was completely immersed in the water and snow. There was no need to refer to the photometer when the tube was placed in the refrigeratory mixture, to perceive at once the reduced illuminating power of the gas, as compared with that of gas at the normal temperature. The photometric indications gave the following results after experiments extending over several:—

At 18°,	illuminating	power .. 100.
" 0°,	"	" 76 to 85.
" 20°,	"	" 53 to 40.

The influence of temperature on the illuminating power of gas is thus shown to be very important, but the preceding experiments are not of very great practical value, because the gas rarely issues from the burner at the supposed temperature. Ice is not allowed to form on the burners during the experiments. To judge of the influence of high temperatures, 18° was again taken as a basis. The U-tube was placed in a vessel filled with boiling water, and afterwards with paraffin in order to raise the temperature still higher. The photometric indications showed the following results:—

At 18°,	illuminating	power 100.
" 100°,	"	" 104.
" 160°,	"	" 108.

The influence of high temperatures on the illuminating power of gas is not, therefore, so great as that of low temperatures.—*Colliery Guardian.*

Sunlight on Fire.

PROFESSOR C. TOMLINSON remarks: "The popular idea that 'light puts out the fire,' is so fixed that probably no conclusions drawn from actual experiments are likely to disturb it, especially if they be adverse to the notion. From a series of experiments upon candles of different sizes and weights, in dark chambers and day and sunlight, it was found that the increase of temperature led to increase of consumption of material, and *vice versa*, and the whole result may be stated that, in any case, the difference is so small that it may be referred to accidental circumstances, such as temperature and material; the final conclusion being that the direct light of the sun, or the diffused light of day, has no action on the rate of burning, or in retarding the combustion of an ordinary candle."

Iron.

IT is estimated that, in round numbers, one hundred and ten thousand tons of steel rails, equal to eleven hundred miles of steel road, were laid in the United States up to the close of 1869. These rails are in use in more than fifty roads, chiefly of English, partly of American, and some of Prussian manufacture.

MINING COMPANIES AND STOCK QUOTATIONS.

GOLD AND SILVER COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
Alameda Silver		A. Queran, 108 Wall st	$2,000,000	$10 00		
Ada Elmore	South Boise, Idaho					
American Flag	Nevada District, Col	P. P. Fullerton, 71 B'way	600,000	10 00		
Atlantic and Pacific	Humboldt Co., Nevada					
Bates and Baxter	Colorado			50 00		
Benton	Colorado	W. F. Drake, 15 Broad	500,000	5 00		
Briggs	Colorado	J. P. Davies, 19 Cliff	1,000,000	100 00		
Black Hawk	Colorado	C.T.Whittington, 48 Broad	2,500,000	100 00	60	100
Bobtail	Colorado	J. Stanton, Jr., 25 Nassau	1,000,000			
Bullion Consolid'ed Gold	Colorado					
Burroughs Gold	Colorado					
Central Gold					22	25
Consolidated Gregory	Colorado				2 00	2 05
Combination Silver	Nevada			100 00		1 50
Columbia Silver	Austin, Nevada	J. M. Brown, 155 B'way	5 000,000			
Commercial Silver		J. E. Smith, 26 Pine	3,000,000			
Corydon	Gilpin Co., Colorado	J. Samuels, 40 B'way	500,000			
Downieville	Colorado		2,500,000	25 00		
Eagle Gold	Gold Dirt Dist., Col	J. P. Davies, 19 Cliff	300,000	1 00		
Empire Gold and Silver	BodieBluff,MonoCo.Cal	H. K. Gates, 70 B'way	1,000,000			
Edgehill		A. Fullerton, 71 B'way	10,000,000			
Esperanza Silver		Ezra Clark, Jr., 13 William	400,000			
Fisk Gold		H. Johnson, 195 Fulton	500,000			
Forest Queen		E. B. Beet, 62 B'way	1,000,000			
Golconda Gold	Sherbrooke, C. E	H. Adams, 71 Broadway	2,000,000			
Gunnell Gold	Colorado	J. H. Rolston, 80 B'way	1,000,000	50 00		
Gunnell Central	Colorado	C. B. Bostwick, 16 B'way	3,000,000	10 00		
Gold Rock		R. M. Lockwood, 93 Wall	400,000			
Grass Valley					24	
International Silver		J. W. Brazier, 26 Pine	600,000			
Hope Gold	Colorado		5,000,000			
Holman			2,000,000	25 00		
Kipp & Buell	Colorado		300,000			
Knickerbocker Gold		J. H. Rolston, 80 B'way	200,000	100 00		
La Crosse Gold	Nevada Dist., Col	P. P. Fullerton, 71 B'way	1,000,000		10	12
Lander Hill T. & S	Nevada	M.L.Catherwood,74 B'way	1,000,000			
Lewis Gold	Georgia		1,000,000			
Liberty Gold					1	3
Manhattan Silver	Nevada	M. L. Ogden	400,000			
Maraposa common	California	Jas. H. Ferdon, 34 Wall	12,000,000			9⅛
Mariposa preferred	California	do. do.			18	18¾
Montana Gold		G. De Cordova	400,000			
Montana M. L. & M. Co.	Montana	A. M. Hoyt, 22 William	250,000			
Montrose	Clear Creek Co., Cal	W. W. Perkins, 71 B'way	1,000,000			
New York Silver	Nevada	Thos. Sproull, 78 B'way	1,500,000			
New York and Austin	Nevada	E. R. Siccomb, 70 Wall	500,000			
New York and Owyhee	Owyhee Co., Idaho		1,000,000			
New York and Eldorado		G. H. Munroe, 10 Wall	2,000,000		10	
N. Y. & Montana M. & D.	Montana	F. A. Chapman, 20 Nassau	1,250,000			
N. Y. & Silver Peach	Nevada	R. C. Root, 74 B'way	2,000,000			
N. Y. & Utah P. & M		W. H. Mailler, 108 Wall				
Nye						
Ophir Gold	Comstock Lode, Nev	L. C. Warner, 70 B'way	625,000			
Owyhee Gold		W. H. Smith, 43 Ex. Place	1,700,000			
Pahranagat Central	Nevada	J. E. Smith, 25 Pine	6,000,000			
Quartz Hill Gold		F. Bernard	2,500,000		56	
Reese River Consol'd	Nevada	W. B. Ogden	6,000,000			
Rocky Mountain	Colorado	S. M. Pond, 70 B'way	500,000	10 00	4	7
Rollins Gold		Thos. Bond, 132 B'way	600,000			
Sensenderfer	Colorado	H. A. Shewil, 19 Broad	1,000,000		1 00	
Silver Bend		F. W. Macy, 20 Nassau	1,500,000			
Silver Mt. Silver		H. A. Moen, 71 B'way	1,000,000			
Silver Peak & R. M	Nevada	W. B. Ogden, 52 Wall	5,000,000			
Smith & Parmelee	Colorado	W. H. Hollister, 6 Broad	2,500,000	20 00	1 55	1 65
Social & Steptoe Con		T. H. O'Connor, 24 Nassau	450,000			
Standard Gold		C. B. Bostwick, 169 B'way	500,000			
Symonds Forks					35	
Twin River Silver	Nevada	J. F. R. Hadden, 20 Nassau	800,000	100 00		
Texas Gold	Colorado		500,000	10 00		
Union Gold	Colorado	F. A. Potts, 110 B'way	1,200,000			
Wash. Mill & Silver	Nevada	W. W. Perkins, 71 B'way	300,000			
Wauba Yuma	Arizona	J. W. Sisby, 36 Pine	6,000,000			

COAL AND IRON COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
American Coal Co		M. A. Myers, 119 B'way	$1,500,000	$25 00		
Ashburton Coal Co		J. T. Rollins, 41 Pine	2,500,000			
Block House Coal		D. B. Keeler, Jr., 43 Pine	1,000,000			
Brewster Iron		H. Robison, 165 B'way	150,000			
Broad Top Coal & Iron Co	Pennsylvania	B. Love	2,000,000			
Cameron Coal Co		J. A. Simpson, 40 B'way	2,500,000			
Carbon Hill Coal Co		J. Silsby, 36 Pine	1,000,000			
Central Coal		F. P. White, 111 B'way	2,000,000	100 00		
Clifton Iron Co		P. H. Riordan, 34 Pine	1,250,000			
Columbia Iron		E. D. Webb, 77 Cedar	1,000,000			
Consolidation Coal	Maryland	J. S. Mackie, 71 B'way	5,000,000			
Crawford Coal		E. Clapp, Prest, 137 B'way	1,000,000			
Cumberland C. & I. Co		E. Kisean, 90 B'way	5,000,000		27 75	32 00
Derby Coal Co		W. S. Davison, 11 Broad				
Dover Coal and Iron Co		L. Chase, 88 Wall				
Del. & Hudson Canal Co		R. H Nerderpol, 7 Nassau	15,000,000	100 00	100	
Ebervale Coal		G.L.Stout, Treas.,111 Br'y	500,000			
Fall River Bituminous		D. T. Blauvelt, 43 Pine	1,000,000			
Farrar Coal		C. H. Jones, 43 Pine	250,000			
Fisher Iron Co		M. Ellis, 19 William	100,000			
Hamp're & Balt. Coal		S. M. Pond, 70 B'way	500,000			
Iron Cliffs Co		C. J. Canda, 52 Wall	1,000,000			
Jackson Iron		G. P. Loyd, 119 B'way	300,000			
Kemble Coal & I. Co		R. A. Wight, 26 Ex. Place	300,000			
Keokuk Coal		J. F. Franklin, 112 B'way	100,000			
Lackawanna I. & C	Pennsylvania	E. C. Lynde, 52 Wall	1,200,000			
Lewis Run C. & I. Co		C. A. Sanborn, 80 B'way	750,000			
Lykens Val. Coal Co		F. A. Platt, 13 William	800,000			
McKean Co. Bit. Coal Co		J. H. Rolston, 80 B'way	1,500,000			
Lehigh & Susquehanna		E. W. Cark, Philadelphia, Pa.				
Mahanoy			400,000	100 00		
McNeal C. & I. Co		C. C. Godwin, 71 B'way	500,000			
Mount Riga Iron		G. M. Newton, 42 Cedar	300,000			
New Boston Coal		C. H. Ogden, 55 B'way	2,000,000			
N. Y. Con. C. & I. Co		A. T. Levine, 16 Wall				
N. Y. & Lehigh Coal		T. Simpson, 111 B'way	150,000			
Pacific Coal Co		G. Wrighton, 34 Wall				
Peekskill Iron Co		W. Murdock, 7 Nassau				
Pennsylvania Coal Co		E. H. Mead, 111 B'way	3,200,000	50 00		
Richmond Iron Co		[illegible] H. Smith, 165 B'way	1,000,000			
Scotia Coal Co		[illegible] N. Soper, 42 B'way	2,500,000			
Spring Mt. Coal		[illegible] Runyon, 111 B'way	1,250,000			
Springfield & D'p Run C.		E. D. Webb, 77 Cedar	600,000			
Stout Coal Co		[illegible] S. Comstock, 111 B'way	500,000			
Susquehanna & Wyoming		E. Potter, 40 B'way	1,000,000			
Tannerdale Coal		[illegible] T. Ludlaw, 71 B'way	250,000			
Wash. Mutual Coal		M. C. Baker, 117 B'way	420,000			
West Point Iron Co		R. C. Brock, 110 B'way	500,000			
Wilkesbarre C. & I. Co		W. H. Tillinghast, 80 Br'y	3,400,000			
Wyoming Val. Coal Co		E. Potter, 40 B'way	1,000,000			

COPPER AND LEAD COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED
Anita Copper	California	J. A. Ferguson, 8 Wall				
Corinth Copper	Corinth, Vermont	S. H. Howard, 191 B'way	$500,000	25 00		
Davidson Copper			500,000	25 00		
Eagle Harbor Copper	Michigan	W. H. Smith, 43 Ex. Place	500,000	25 00		
Evergreen Bluff Copper	Michigan	F. W. Caper, 44 Ex. Place	200,000			
Globe Copper		R. K. Rickard, 19 Nassau	500,000			
Grand Portage Copper Co		A. S. Kellogg, 22 Pine				
Guymard Lead		Samuel Vernor, 38 Pine				
Hilton Copper		W. H. Smith, 43 Ex. Place	500,000			
Hope Copper		J. W. Davis, 19 Nassau	500,000			
Hudson River Copper	New York	T. Clarkson, 22 William	1,500,000			
Indiana Copper Co		J. M. Mills, 25 Nassau	500,000			
Isle Royale Copper	Michigan	F. W. Caper, 44 Ex. Place	1,000,000			
Keweenaw Copper	Michigan	F. W. Caper, 44 Ex. Place	500,000			
Lake Superi'r Silver Lead	Michigan	A. S. Kellogg, 22 Pine	1,000,000			
Omiga Copper	Michigan	S. Cooper, 7 Pine	500,000			
Ridge Copper	Michigan	J. L. Gardiner, Jr., 43 Ex. P	500,000			
Rockland Copper	Michigan	A. Fullerton 71 B'way	500,000			
St. Joseph Lead	Michigan	J. W. Jones, 6 Broad st,	1,000,000			
St. Marguret Copper		E. P. Sutton, 43 Pine	250,000			
Schoolcraft Copper		R. Walsh, 22 William	500,000			
Superior Copper	Michigan	A. Fullerton, 71 B'way	500,000			
Union Copper		A. S. Kellogg, 22 Pine	500,000			
Vermont Copper	Vermont	J. C. Fly, 191 B'way	500,000			
Wallkill Lead, asst		S. M. Pond, 70 B'way				

MISCELLANEOUS.	SITUATION MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
American Zinc Co		W. E. Lawton, 19 Cliff	$1,000,000			
Bigelow Blue Stone Co		H. Bogardus, 14 Pine			9¾	10
Quicksilver			250,000			
Covill B. L. M. & M'f. Co		C. R. Bostwick, 302 Pearl	300,000			
Manhattan Marble		H. K. Gates, 70 B'way	1,500,000			
N. Jersey Zinc Co	New Jersey	A. H. Farlin, 61 Maiden L'e.				

Calcining and Smelting Ores, &c.

MR. CHARLES WILLIAM SIEMENS thus describes his improvements in calcining and smelting ores, and in furnaces and apparatus employed in connection therewith, which furnaces are also applicable to other purposes: If iron or other metallic ores contain water of hydration, carbonic acid, sulphur, or other volatile constituents, they are generally roasted or calcined in kilns, or upon the bed of a long reverberatory furnace. The calcining kiln has the advantage of greater simplicity, but is only applicable to ore in pieces of such size that the flame can circulate between them, whereas the calcining furnace has to be resorted to in dealing with ores of small grain or of a friable nature. The latter process has the advantage that no residual matter resulting from the combustion of solid fuel is mixed with the ore, and that the temperature and time of operation can be varied at will, but on the other hand it involves a considerable amount of attention and manual labor in turning the ore. To avoid this it has also already been proposed to calcine the ore in rotating cylinders. The first part of my invention consists in effecting the calcination of metallic ores, and also the burning of such substances as cement, lime, or plaster of Paris, in a drum or cylinder of iron lined with hollow fire-brick forming longitudinal channels, which is mounted upon rollers and is made to rotate round its horizontal axis. The ores or substances to be burnt are introduced through a slanting hopper at one extremity of the rotating drum, and, being worked gradually forward by the rotation under the influence of heat, they drop in a continuous manner from the other open extremity into a stationary close receiver or chamber, whence they can be removed at pleasure. A smoke box, communicating with a chimney, is fitted to the extremity of the cylinder where the ores enter, and a current of air is induced by the chimney to pass through an outer jacket of the smoke box, and through the longitudinal channels in the lining of the drum itself to the ore-receiving chamber, where it is met while in a heated condition by a current or currents of combustible gas, which has by preference also been previously heated by passing through a jacket surrounding the receiving chamber. The flame thus resulting at or near the extremity of the exit of the rotating drum passes through the same (heating the ore), and thence through the smoke box to the chimney, being by that time thoroughly deprived of heat by the cold incoming ore and the incoming air in the smoke box jacket. The combustible gases employed may be derived from a blast furnace or from a gas producer such as described in the specification to my former letters patent, No. 167 of 1861, and No. 3018 of 1864; or liquid fuel or solid fuel in form of powder may be employed, which is forced in by a jet of steam or a current of air under pressure. If the volatile substance to be removed from the ore or other substances is carbonic acid or moisture, a sufficient supply of gas must be admitted to raise its temperature near the exit to the requisite degree, but the supply of gas may be very much reduced, and may even be stopped entirely if sulphur is emitted from the ore in considerable quantity. The sulphurous acid produced in that case may be condensed or utilised by passing the products of combustion through a scrubber or through lead chambers on their way to the chimney or to an exhausting apparatus, or a jet of water may be introduced at the bottom of the smoke box for condensing the gases.

By leading the combustible gas, or its substitute of liquid or solid fuel, forward through a pipe into the rotating drum, the combustion may be conveniently made to take place at a point at some distance from the exit end of the drum, in order to expose the calcined ore finally to the chemical action of the uncombined oxygen of the air passing in, and to impart additional heat to the air and gas before entering into combustion. By the accumulative action thus set up, the maximum temperature within the rotating drum may be raised even to a white heat. If the ores contain such foreign substances as may be rendered volatile or soluble by the chemical reaction of another substance under the influence of heat, such other substance may be charged in with the ore in the requisite proportion. Thus, for instance, if the iron ore under treatment contains copper, common salt may be added, and the chloride of copper produced may be separated by levigating the calcined ore, which may be made to fall through a spout from the revolving drum into a cistern filled with water, whence it is raised, by a Jacob's ladder, to the platform or hopper of the smelting furnace, being at the same time subjected to the action of a shower bath of fresh water, for removing therefrom all soluble matter, and the copper dissolved in the bath may be separated from time to time by well-known processes. In cases where the calcined ores have not to be washed, but are intended to be smelted or reduced into the metallic state, I prefer to place the calcining cylinder above the smelting or reducing furnace, in order to save the heat residing in the calcined ore for the succeeding operation.

Thus these calciners may be placed on the top of a blast furnace, or over the receiving hopper of the ore reducing apparatus described in the specification to my patent, No. 1892 of 1868, for the manufacture of cast steel from the ore. If the ore to be calcined contains sulphur or phosphorus, I mix the same with, say ten per cent. of solid carbon, such as coke or anthracite, in order to effect its partial reduction. At the same time I direct a divided current of steam through the mass of highly heated calcined ore accumulating in the close receiver before alluded to, which steam, being highly superheated, will be decomposed in contact with the heated reduced metal and carbon, liberating nascent hydrogen, which will combine with the phosphorous and sulphur, carrying off these objectionable admixtures of the ore. If I want to produce pulverulent metallic iron, I combine the calciner above described with the rotating ore reducing apparatus described in my former patent just alluded to, the reduced ore being made to fall into a closed metallic chamber, which is cooled externally by currents of water or gases, and which is provided with doors at the lower extremity for the removal of the pulverulent iron after it has had time to cool, to prevent its taking fire when brought into contact with the atmospheric air. The calcining apparatus before described is also particularly applicable to zinc ores. These ores may be mixed with carbon and distilled in the usual manner, but I prefer to employ inclined retorts opening at both ends, so as to admit of being charged and discharged in a continuous manner. These retorts are arranged in double rows, in a regenerative gas furnace of a special construction, resting with their inclined sides against a central longitudinal wall in the middle of the furnace. Into this wall passages rise from the four regenerators, such passages terminating in orifices facing the two opposite working sides of the furnace, the gas and air passages being arranged alternately. The heated air and gas, in issuing in parallel streams towards the working side, which is for the time being the front of the furnace, and rising between the retorts, enter only gradually into combustion, and diffuse a uniform and gentle heat throughout the furnace. The gases turn over the middle wall towards the back of the furnace, where, after descending between the second row of retorts, they escape promiscuously through the second set of air and gas passages, and through the second pair of regenerators downward towards the chimney. On reversing periodically the furnace valves, the direction of the flame through the furnace is also reversed. Instead of using inclined retorts arranged for being charged in a continuous manner, one or more tiers of ordinary Silesian or Belgian retorts may be so arranged in the furnace that the ends of the retorts farthest from the two working sides may be supported upon the before mentioned central wall, through which the gases are introduced and withdrawn alternately. The space below the retorts, where gases meet, serves also to receive pieces of broken retorts, which can be readily removed from time to time through doors in the front and back of the furnace. The same arrangement of furnace, having a middle wall into which two sets of alternating gas and air passages rise, with orifices facing the two working sides of the furnace, is also applicable with great advantage to other purposes, such as heating gas retorts or heating the pots for melting glass. Two rows of glass pots being placed upon sieges on either side of the central wall, and being all covered by a longitudinal arch of fire-brick having suitable working holes provided on both sides, a very steady heat is produced, affecting each pot in precisely the same manner, no matter how many pots may be placed in one row. The sieges are inclined towards the sides of the furnace, where spilt glass is removed through foot holes; the necessity for glass pockets is thereby obviated, and the construction of the furnace is much improved as regards cost of erection and of maintenance.—*Colliery Guardian.*

Absurd Inventions.

THE nature of some applications for patent at the Patent office in Washington is sometimes amusing by the utter absurdity of the invention claimed, and the continual occurrence of such claims is proof that the price of a patent is low enough. Cheapen it, and their number will increase; raise the price, and they will diminish. But in the latter case, real good inventions may also be held back by the inability of the inventor to pay, and perhaps this is even now sometimes the case.

The last curiosity in this line is a marine propeller with the screw in front. Its shaft running back through the vessel, is, by means of a gearing, connected with the cross shaft of the paddle-wheel. To move this machinery, and to keep it going, it is only necessary to start the vessel, and for this purpose masts and sails are used. The vessel once started, the screw will be set in motion, and this will of course turn the paddle-wheels, which are geared so as to rotate faster than the vessel progresses. They will thus continue to propel it, while the forward motion keeps the screw revolving. When this point is reached, the sails may be dispensed with, and the only fear of the inventor appears to be, that the vessel may dash on too fast. But then he is equal to the emergency; it is only necessary to disconnect the gearing between screw and wheels, so that they cannot help one another any more, and the vessel will stop. This application was, to the utter disgust of the inventor, *not granted.* He was confident of success, and as the possibility of obtaining money for making a trial on a large scale depended on the granting of the patent, he accuses the United States Patent office of preventing him to make his fortune, of being acknowledged the greatest of engineers, of earning honors as the benefactor of the race, etc., etc.

Some time ago, another inventor came to us to obtain our opinion on a plan for propelling vessels by means of hydrogen gas. In the bottom of the vessel was a large air-tight copper tank, filled with zinc or iron scraps; sulphuric acid and water were admitted, and the gas developed under pressure, which then was to be allowed to blow out under the rudder against a propeller screw, turn this, and so propel the vessel. When we remarked that much more power could be obtained from the gas by exploding it with a mixture of air, than by simply using its weak blowing pressure, the inventor had soon modified his plan accordingly, by adopting a piston motion and crank, to drive the piston and turn the propeller by the explosive mixture. He was bound to make hydrogen propel vessels.

The attempt to run vessels by wind power in any direction and entirely independent of the direction of the wind, has perhaps been tried oftener than anything else, in different localities, and still in the very same manner. We refer to the plan of placing a windmill on the deck and causing this, by means of the proper gearing, to turn paddle-wheels. By entire ignorance of mechanical principles, the fact was overlooked, that the pressure on the axis of a windmill will move the vessel in the direction of the wind with a force always surpassing to a certain extent that, which may be obtained from the rotation of paddle-wheels driven by the mill.

New Publications.

TENTH ANNUAL REPORT OF THE BROOKLYN PARK COMMISSIONERS.—This document contains a full report on the business transactions, financial and otherwise, of the Commissioners, during the last year, to which are added the addresses delivered on the occasion of the dedication of the Lincoln monument on the 21st of October, 1869, by Messrs. LOWE and WALLACE, a speech of the Hon. J. S. T. STRANAHAN, President of the Brooklyn Park Commissioners, at a public meeting called for the discussion of the question of the boundaries of the Park on the 30th of March, 1869, and the reports of the Landscape Architects and Superintendents, Messrs. OLMSTED, VAUX & Co., together with the reports of C. C. MARTIN, Engineer-in-charge, and JOHN BOGART and JOHN Y. CULYER, Assistant Engineers-in-charge.

The Commissioners, after arguing the decided advantages accrued to the city of Brooklyn by the improvements in Prospect Park, chief of which is considered the attraction of a population of taste, refinement and means, and the consequent enhancement of the value of taxable property, proceed to urge the sale of a certain portion of the park lands east of Flatbush avenue, mainly for financial reasons. They calculate that the difference to the city between selling and retaining this land would be at least four millions of dollars, and that besides this the annual revenue of the city would be increased by at least half a million from the enhanced value of the property by private dwellings, which would likely be erected on that land.

The general views upon the subject of a sale are more fully expressed in the speech by the President of the Commission, which is annexed to the report. Next follows a general review of the work accomplished during the year in the different parks of the city, and a financial statement of the receipts and expenditures of the Commission. It is announced in this connection that the fund for the construction of Prospect Park has now reached the limit assigned to it by the law of 1868, which appropriated three million dollars, including the bonds previously issued for this purpose. The expense of completing the Park is estimated by the Commissioners not to exceed two million dollars. The total indebtedness of the city at this time on account of the Park is given as $6,975,648.41.

We extract the following from the financial statement of the Commissioners for 1869:

CONSTRUCTION ACCOUNT FOR PROSPECT PARK.—Receipts, $800,594.40; expenditures, $766,680.96; balance to credit of Prospect Park, $33,913.44.

The total receipts and expenditures on account of Washington, Carroll, City Hall and City Parks are given as follows:

Receipts				$47,095.13
Expenditures for Washington Park			$51,406.81	
"	Carroll	"	663 30	
"	City	"	44.27	52,114 38

On account of the parade ground the receipts were $18,055.43, and the expenditures $18,818.

It will be perceived that the two last accounts show both a deficiency.

The maintenance account is given as follows:

Received from the City for the maintenance of all the Parks $68,400 00

Expended on the same account:

For	Prospect.	Washington	Carroll.	City.	City Hall.
1. Roads	$7,433 69				
2. Walks	628 38	467 18	104 37	109 99	109 19
3. Structures	393 57	3 51	13 91	510 95	21 93
4. Plantations	16,660 96	1,947 61	214 13	48 36	231 37
5. Water	5,148 06	348 33	17 00		
6. Drainage	1,254 89	34 84	8 10		1 48
7. Ice	1,95 89				
8. Tools	77 99	55 59			
9. Keepers	42,962 29	2,115 74	1,028 17	342 21	
10. General	2,927 90	15 18	25 87		6 70
Total	$79,439 62	$4,987 98	$1,408 55	$1,011 51	$370 67

Grand Total $87,218 33

Deficiency of maintenance for 1869 ..... $18,818 33

The reports of the superintendents and engineers are very interesting, and give all the details in regard to the construction of Prospect Park especially, and a brief account of the work done on the other parks. For full particulars, we refer to the reports themselves. Suffice it to say here that the amount of work accomplished during the year appears to be very satisfactory. In another part of the present number we publish a description of the beautiful Lullwood bridge, and in our next we shall give a full account of the mode of construction of the large well, the engine and pump, water-supply, and all connected with this remarkable undertaking.

Bursting Pressure of Boilers.

THE *Locomotive* says: "In casting up the bursting pressure of boilers, it is necessary that some number representing the tenacity of plates one inch thick be decided upon. Some engineers estimate it at 34,000 lbs., while others place it so low as 25,000. These figures suppose the iron to be of the best quality. By an inch of sectional area is understood a sufficient surface of boiler plate of any thickness under one inch, to make a thickness of one inch. In other words, suppose a boiler to be constructed of half-inch iron, and from its end we cut off a section or hoop one inch long, two such sections would be equivalent in quantity of iron to one hoop one inch thick. In testing the strength of iron, bars one inch square are used; in estimating pressure on boiler plates, sufficient surface must be taken for each thickness to equal in quantity a bar of iron one inch square. If we assume that single-riveted boilers will sustain a strain of 34,000 lbs. per square inch of section, the strain on each superficial inch on a plate three-eighth of an inch thick would be three-eighths of 34,000."

THE ENGINEERING AND MINING JOURNAL.

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ROSSITER W. RAYMOND, Ph. D., Editor,

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The Paris Exposition Reports.

NOTHING would have been easier, and perhaps nothing was, in fact, more likely, than that the reports of the Commissioners of the United States to the Paris Exposition, taking their chance among public documents, should have been so bungled in the editing and printing as to become, if not absolutely worthless, at least not worth the time, trouble and cost involved in their preparation. This result was happily averted by the selection of Professor W. P. BLAKE, to edit and superintend the publication of all the reports. Mr. BLAKE'S labors are now, we suppose, gradually drawing to a close. To his judgment, good taste, wide personal acquaintance with the subjects of the reports, and literary skill, we owe a series of volumes which embody in useful and agreeable form the observations of American experts on the vast display of industrial skill presented by the Great Exposition of 1867.

That festival was, no doubt, an agreeable diversion to the thousands of strangers who visited Paris during its continuance. Among these, doubtless, there were many keen and observing manufacturers and others, who gathered useful hints for their own business from the objects exhibited. Newspaper correspondents, too, made interesting superficial surveys of the Exposition, and furnished delightful pictures of the *tout ensemble*. Vague visions of splendor, thus aroused, will no doubt continue to haunt the world until they are eclipsed by the glory of some new pageant. But the greatest practical benefits to the nations must come from the careful analysis and reports of those who, dividing the labor of inspection, and studying each his appropriate department, have put on record, for the instruction of millions who could not visit the place for themselves, the results of their observation.

The Exposition has vanished into air; but thanks to such faithful labors, we may now compass its real significance and utilize its contributions to the arts, far more completely than if, bewildered with its extent and dazed with its magnificence, we had wandered for a month through the brilliant display itself. In fact, the true, effective and forever beneficent Exposition was merely begun in the Champ de Mars. It is to be found in the literature to which that *fête* gave rise; and, though other nations have been more profuse in expenditure, and their official publications have been more imposing than ours, we think that, on the whole, no series of volumes on this subject has been at once so compact and popularly useful as that which comprises the reports of the American Commissioners.

We have from time to time noticed these volumes as they appeared, and in many cases have transferred to our columns copious extracts, suitable to the character of the JOURNAL. There are now upon our table three of the reports; that of Dr. F. A. P. BARNARD, on Machinery and Processes of the Industrial Arts and Apparatus of the Exact Sciences; that of Professor W. P. BLAKE, on Civil Engineering and Public Works; and that of Mr. H. F. Q D'ALIGNY, assisted by Messrs. HUET, GAYLER and LEPAINTEUR, on Mining and the Mechanical Preparation of Ores.

Concerning Dr. BARNARD'S report, it is difficult to speak in terms of adequate praise. The extraordinary accomplishments of the author, and his eminence in the usually disconnected fields of literature, theology, social and educational philosophy, and natural science, would indeed raise our expectations concerning any volume to which he would be willing to attach his name. But men of great reputation are too apt to disdain the conscientious annd minute labors by which reputation is achieved. In the present instance, the President of Columbia College has added the faithful industry of a beginner to the mature judgment and comprehensive views of a veteran; and the result is a work which would make him famous, were he not so already. Aside from its scientific accuracy and admirable plan, it has the charm—too often wanting in such publications—of literary polish. Those who despise the advantages of a liberal education will be forced to confess, as they are led along through this bulky volume by the clear, logical and flowing style in which its most prosaic or abstruse discussions are clothed, that "the art of putting things" is something beyond mathematics and chemistry. There is something satisfactory and restful to the reader in the masterly sentences of an author who says exactly what he means, and says it in such a way as to invite, rather than repel, the study of his thought. The introductory chapter, on The Relation of Invention to Industrial Progress, is a fine example of this mastery of language as well as facts. It is followed by chapters on Motors, Transmission of Force, Accumulation of Force, Measure of Force, Direct Applications of Force, Meters, Boiler Feeders, Special Machines, Processes and Products, Diving and Respiratory Apparatus, Improvements in the Application of Heat, Artificial Production of Cold, Light-house Illumination, Printing and the Graphic Arts—all under the head of Industrial Arts. The Exact Sciences are represented by a general view and by chapters on Physics, Geodesy and Navigation, Meteorology and Mechanical Calculation.

Under each title are grouped the machines and processes appropriate to it; and the whole work constitutes a picture, to be found, we think, in no other English book now existing, of the present condition of the Industrial Arts and the apparatus of the sciences. A few American inventions and improvements, of very recent date, which were not represented at the Exposition, are omitted; but this is not a ground of criticism upon the book, nor a real deficiency in its value. We do not ask people to go abroad for us, in order to come back and tell us what we have at home.

Excellent plates and wood-cuts, and, above all, an analytical index, perfect the work, concerning which our only regret is, that the small edition published by the State Department will not admit of its general distribution. When the series of which it forms a part is complete, however, the public libraries of the country will at least be supplied; and we predict that its frequent use will demonstrate its value.

Prof. BLAKE'S report on Civil Engineering is brief, and confined to a few important topics. Other commissioners have in fact covered a large portion of the ground; and we infer that these few pages are only intended to put on record a number of things omitted elsewhere. What there is of it is so good as to make us wish it were more. We published last week a specimen of its quality, in the chapter on Materials for Construction. There are in addition accounts of the Lake-Tunnel at Chicago, of the construction of the Suez Canal, and of miscellaneous novelties in engineering.

The report of Mr. D'ALIGNY, and his assistants, on Mining and the Mechanical Preparation of Ores is likewise brief, but very suggestive. The three French engineers whose names are associated with that of the United States commissioner contributed to the preparation of three distinct reports: Mr. ALFRED HUET on the Exploitation of Mines, Mr. ALFRED GEYLER on Boring Machines, and Mr. C. LEPAINTEUR on the Mechanical Preparation of Minerals. The three reports have been combined into one, in three parts, thus preserving the original distinction. The principal subjects treated under Boring, Drilling and Excavating are three in number. One of these, the subject of rock-drills, is not altogether unknown in the United States. The apparatus of BURLEIGH, HAUPT and LESCHOT are well known and successfully applied here. The two other main topics of this section, namely, boring large shafts, and coal-cutting, are comparatively new to engineers of exclusively American experience, and the particulars given in this report will arouse very general interest. Under the head of Transportation, Hoisting and Pumping, there is little of novelty presented, though much of interest. Some of our deep mines are not surpassed in these respects, though the average condition of American mine-engineering is lower than we could wish. The Mechanical Preparation of Ores, which concludes the report, is a subject of great practical importance, but the brief notices of new apparatus in the present volume are only valuable to those already acquainted with the principles of the subject. In fact, the whole report is for engineers, rather than for young students of the science.

There are other reports in this series, soon to appear, and these we shall notice hereafter.

Mining Statistics.

WE shall present next week some account of the contents of the Report of the Special Commissioner on Mines and Mining, presented to the House of Representatives on the 18th instant, and ordered to be printed. It remains with Congress to determine whether an edition shall be printed for distribution. In this connection, we reprint a portion of an article from the London *Saturday Review* of August 28th, 1870, as showing how such documents are regarded by economists abroad. After speaking of these reports as among "those valuable repertories of practical information which form so remarkable a feature of American literature," and contrasting their publication with the "parsimonious economy" of "recent English policy," the *Saturday Review* continues:

"The office of furnishing information respecting the condition and prospects of different branches of industry, the resources of different regions, and all that can assist the development of trade or direct the movements of population, is regarded as one of the most important functions of government. Many permanent departments and innumerable temporary commissions have no other object. How thoroughly and consistently this work is performed, the volume before us—a continuation by Mr. RAYMOND of Mr. BROWNE'S investigations—affords a curious illustration. One of the points which appear to have engaged his careful attention, is the condition and the influence of customary and statute law upon the mining industry of the United States. But Mr. RAYMOND is not content to explain the actual state of that law and its immediate operation. He completes his work by an inquiry into the mining laws of other countries, whether ancient or modern; collects all the information he can find, regarding the Greek, Roman and Carthagenian systems, discusses the methods of working the silver mines of Sunium and the tin mines of the Cassiterides, and the regulations imposed by the Roman government, when its conquests had made it heir alike to the discoveries of Athens and of Carthage, to the gold mines of Thasos, the silver of Attica, and the varied mineral resources of Spain and Britain. He gives a careful summary of the customs and legislation of European powers, of the mining law of feudal Germany, of modern Prussia, of imperial Spain, of commercial England; and brings all his information to bear upon the problems presented by the new conditions under which gold and silver mining has developed itself in America. He sets forth clearly the difficulties of the existing and somewhat anarchical system which has grown up out of Congressional and Territorial, general and local legislation, the common law of Mexico, the customs of the diggers, and the by-laws which in any district may be enacted and repealed from time to time by a 'mass meeting' of the miners—a machinery often abused for the worst purposes by dishonest speculators. * * * And, having made plain the abuses and defects of the actual system, he suggests a complete scheme for their correction. The absence of such a machinery for watching and taking note of the operation of law has been noticed by Mr. HENRY TAYLOR and other thoughtful writers as one main cause of the slow, uncertain and unsatisfactory progress of English legislation. The fact that such investigation and report form not only the special duty of many commissioners *ad hoc*, but a part of the duty of most American departments, may account for the fact that, in spite of corruption and party spirit, and all the vices which infect the political life of the United States, the practical results of their legislative and administrative system appear to be not only compatible with, but conducive to, the rapid and remunerative development of their vast and varied natural resources."

Some New Suggestions on the Bessemer Process.

IT is well known that white cast-iron is not adapted to the BESSEMER process, on account of its deficiency in free carbon. Mr. STOCKHER, in Newberg, Germany, attempted to supply this want by blowing graphite dust into the converter with the blast of air. As was to be expected, the iron refused to go into combination with the coal dust, the time being too short and the contact too imperfect. The graphite dust burned very imperfectly, the usual time necessary for the different periods of the process was not affected, and the resulting metal unsatisfactory. We are satisfied that the introduction of a small quantity of spiegeleisen, previously melted in a large ordinary crucible—say of one hundred pounds to the ton of white cast-iron—would be more effective to supply the wanting carbon than the black lead dust from the blower; and if anything must be blown in to augment the heat in that stage of the process during which the carbon is prominently burning out, why not introduce a hydro-carbon with the blast? A comparatively minute quantity of benzine or gasoline vapor, introduced with the blast of air, it seems, would be very effective. Lately a patent has been taken out to use pure hydrogen in place of air as a blast in the BESSEMER process. This, of course, is all nonsense, as well as the idea of using nitrogen alone. The principle of the process being the burning of silica, carbon, etc., out of the iron by the air, the air is absolutely necessary. Pure oxygen alone would, of course, act too energetically, as it would burn up the iron also; it must, therefore, be diluted with nitrogen, just as it is in nature. A small amount of some hydro-carbon gas may perhaps be added in such cases where the iron is so poor in carbon that the temperature cannot be raised sufficiently high in certain stages of the process.

These suggestions are given with the supposition that no patent exists for the same idea, which we ardently hope is the case; there are already too many patents for minor details in diverse metallurgical operations, which rather hinder the free development of this branch of industry.

Plumbago Mines.

WE are often in receipt of samples of plumbago found in different parts of the country, and, to save unnecessary expense, we wish to communicate the information for all concerned, that this substance is by no means scarce, and if not actually found in a state of tolerable purity, has scarcely any value in the market. In fact, the pure article is found in quantities equal to the demand. New discoveries of very pure plumbago occur almost daily, especially in Ceylon, where the production has recently largely increased, so that the exportation rose from twenty three to one hundred tons. It has quadrupled in the last five and doubled during the last year. The finer qualities are used for so-called lead-pencils, the consumption of which is increasing at an almost incredible rate.

Boring for Salt in Prussia.

FOR the last two years borings for rock-salt have been in progress in Sperenberg, near Berlin, Prussia; the latest reports, up to February, 1870, are that a depth of 2,725 feet had been reached, and the thickness of the salt-bed explored to 2,439 feet. In order to judge of the exact position and extent of the same, a second boring was being undertaken.

Increase of Moisture on the Plains.

The Nevada *Inland Empire* is responsible for the following remarkable statements :

"For some time past there has been a question before the people of this basin and of the plains east of the Rocky Mountains, that has as yet failed to be satisfactorily answered. It is—'Why are the streams carrying more water than in former years?' The great plains are fast losing their arid nature, and through them are running streams in places where twenty years ago there was not a drop of water ; and where at that time there were small streams, they are very much enlarged. In many cases this change has been of great value, as it has given to the traveler a supply of water that had previously been denied.

"When the first emigrants crossed the plains to California, the great objection urged to the trip was the scarcity of water on the greater part of the route. Within a few years this has been all changed, and in the beds of old streams that were dry when first found, there is now water for all purposes required. The Laramie plains are not now destitute of water, whereas, some years ago, there was none, and travelers had to carry water when passing over them. There can be no doubt that for the last ten years there has been a continual increase of water throughout the whole desert country between the Missouri and the Sierra Nevada. The Arkansas was dry in 1862 from the Pawnee Fork to the Cimaron Crossing, and previous to that time the Pecos was dried up so that at many places the inhabitants were obliged to dig for water ; and the Moro Valley and Plains were at that time almost destitute of vegetation. Now, the vegetation is luxuriant, and it is one of the best wheat-growing sections.

"Denver was built on the banks of an extinct creek, which, it was supposed, would remain dry, but after the settlement, to the astonishment of the people, it became quite a stream, and is now crossed by bridges. The Huerfano, the Roya Pecos and others that were dry during the summer months, ten years ago, are now constantly running in fair streams. We are satisfied that along the whole line of the Union Pacific Railroad there is much more moisture in the air now than there was only a few years since. Again, Salt Lake is seven feet higher than it was ten years ago, and is constantly rising ; and it has been urged by those who have paid attention to the subject, that the rise of water there would produce a solution of the Mormon question before Congress would act upon it. When the Salt Lake shall rise a few feet higher, we shall look for its overflow to reach the Shell Creek range, as evidently at one time water did cover what is now only an arid valley, not direct in its course, but cut up with ranges ; still the continued valley can be traced. This great increase of water will work a great revolution in the opinions of people as to the capacity of the great plains for agricultural purposes.

The only reason why it has been supposed that the great plains cannot be made into good farms, has been the lack of water and timber, as the land in richness has no superior. The increase of water of which we have spoken will do away with one objection, and the discovery of coal over a distance east of Salt Lake for over six hundred miles, will obviate the other. The man who travels over the Union Pacific roads twenty-five years from this time, will find that the sage bush has given way to crops of all kinds growing in the greatest luxuriance, and that the sturdy farmers with happy homes have taken the place of the wandering red men. In our own State this increase of moisture has been noticed, and the old settlers do not hesitate to say that in many places the streams have increased more than one-fourth in size during the past five years, and in some places where there was no water then, there are now small but constantly running streams.

How to Run a Locomotive.

An engineer on the Grand Trunk Railway writes as follows to the *Locomotive Engineer's Monthly:* "I am sorry to hear of some of your engines being burnt, and I think that a great deal of this trouble could be saved by having gauge glasses on ; I speak from experience. I ran an engine a year without one ; and if an engine carries bad water from different causes, as the case may be, it is sooner discovered by the driver and fireman. It is not my opinion that it is an over pressure of steam that causes an engine to explode. In most cases, I think the boiler is gradually getting worn out. The stays of an engine are injured by pumping cold water into it, and letting her contract too quick. An engine going up a grade, may have water sufficient to save the crown sheet ; then, the pumps are put on ; the water falls in the boiler, (the engine is higher behind.) Some men open the fire-box door ; the damage may not be discovered immediately, but it is bad for tubes and boiler. In case this should happen, my advice would be to run no risk, but let off the pressure of steam, pump no water in your boiler, let the engine cool gradually. I never saw safety valves let off steam as fast as it increases ; heating pipes ought to be on in winter and summer. An engine can be run cheaper by keeping the water in the tank warm, and by keeping the boiler high in water. It is also a bad practice to run connecting rods slack ; it is more liable to break a crank, shaft or pins, and more danger of losing keys ; it also causes a heavy knock on the top slide bars. Steam should never be put on in starting too quick, as it affects all connections, particularly steam pipes. A train should never be stopped by reversing and putting on steam, except in case of danger of life or property ; it is liable to break or strain anything connected with the machinery or framing. The larger engines are built, the better for the company, and safer for men. I believe in a short stroke pump, in a cold climate, as there is less danger of it breaking. It is a good idea to have valves in tenders ; there is less danger of bursting hose bags, which often causes detention and trouble. I have often seen safety valves stuck by dirty water forming cement. Cylinders are often cut by running an engine over, not for want of oil or tallow ; but if an engine should run over, it ought to be oiled immediately after. An engine with steel tires is not so liable to slip, and should it slip, work the valves to the furthest extremity with as little steam as possible. When an engine is running without steam, valves should be let run to the full extreme ; it prevents the face from wearing hollow. Every engine ought to be reversed after getting oil or tallow ; an engine bearing a heavy pressure of steam on one occasion is not sufficient proof of its always being capable of doing so. An engineer in getting into any trouble should always speak the truth—for the truth is always best. No man will rejoice at another's downfall. Every man that fails to study the interest of the company fails to study his own. I would like to run a freight engine, 5½ feet wheel, 26 inch stroke by 17—I think she would run cheap.

Behavior of Iron.

Mr. GORE, of the Royal Society of London, has noticed a new fact in the behavior of iron under the influence of heat and strain. A strained iron wire was heated to redness by a current of Voltaic electricity, and then, the current being discontinued, it was allowed to cool. It was observed that there arrived a moment in the process of cooling at which the wire suddenly elongated, and then gradually shortened until it became perfectly cool, remaining, however, permanently elongated. No other metal besides iron exhibited this peculiarity, which Mr. GORE attributes to a momentary molecular change ; and he remarks that this change would probably happen in large masses of wrought iron, and would come into operation in various cases where those masses are subjected to the conjoint influence of heat and strain, as in various engineering operations, the destruction of buildings by fire, and other cases. The phenomenon deserves a further investigation, since every fact relating to iron is of importance.

Sutro Tunnel Company.

THE Sutro Tunnel Company recently elected the following Trustees : Samuel Merritt (President), Michael Reese (Vice President), Abraham Seligman, Henry Barroilhet, John B. Felton, Joseph Aaron, and William H. Sharp. J. Seligman & Co., bankers, were elected Treasurer. W. K. Van Allen was appointed Secretary and General Agent.

Colliery Boiler Explosion.

A SPECIAL dispatch to the *Evening Telegraph*, from Minersville, Pa., says a terrible explosion occurred last Monday night, at the colliery of W. G. AUDENRIED, in Schuylkill county mining region. The large boiler attached to the mine blew up, killing several and badly wounding a number of others. The engine house was blown to atoms.

THE greatest distance at which thunder has been known to have been heard appears to have been six leagues, or thirteen geographical miles ; and the greatest ordinary distances scarcely more than four leagues, or about nine geographical miles.

PROFESSOR GOLTZ, of Königsberg, has been experimenting with frogs, to discover what part of the nervous centre controls movement. He found that, after removing the entire cerebrum carefully, the animal will not jump when touched, but can be made to go through various movements. It has not lost its power of equilibrium, but will change or incline its position to retain equilibrium when the board on which it is placed is tipped. It can be made to croak as if pleased by rubbing the wet finger down its back. Professor GOLTZ concludes that the power of controlling voice and equilibrium is in the spinal cord, and not in the brain.

MARBLE QUARRY IN OHIO.—An extensive marble quarry has been discovered near Harrisburg, a few miles north of Dayton. It is pronounced by marble dealers to be superior to the Vermont marble. A company is organizing to work the quarry. The stone is said to extend for miles, and the supply is inexhaustible.

M. MOEHLER, a Russian mining-engineer, has prepared a geological map of the western slope of the Ural Mountains, which differs in some important points from the results of M. VERNEUIL and Sir R. MURCHISON.

MISCELLANEOUS.

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" Pure added to impure (plans.
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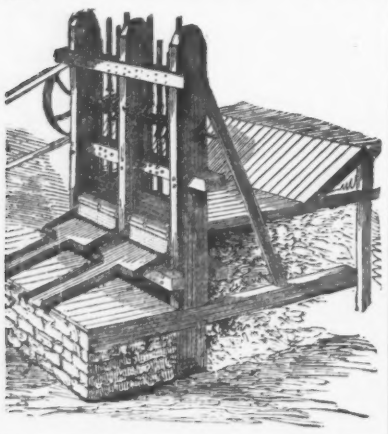

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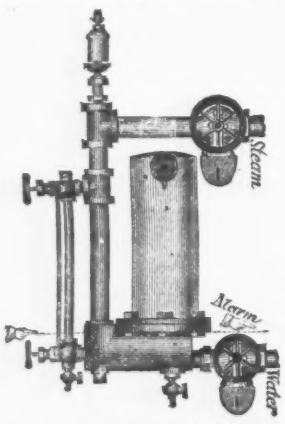

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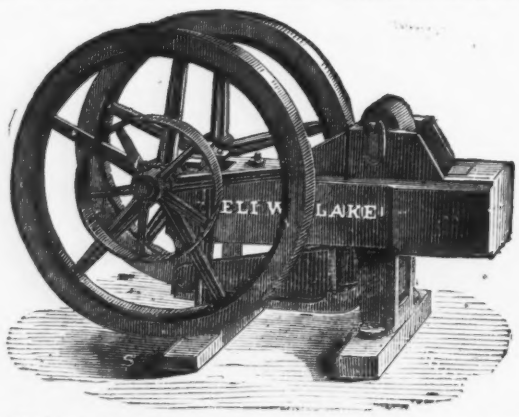

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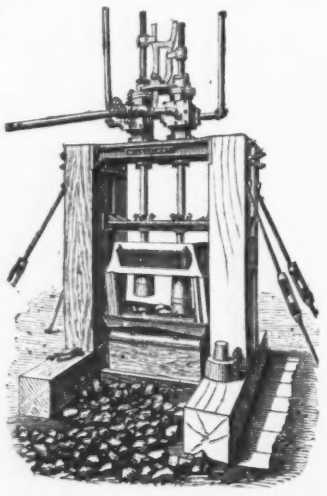

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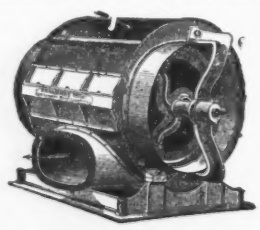

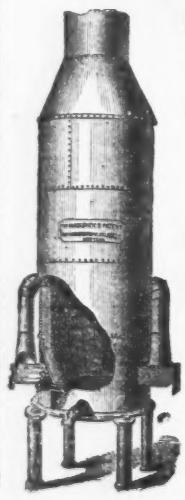

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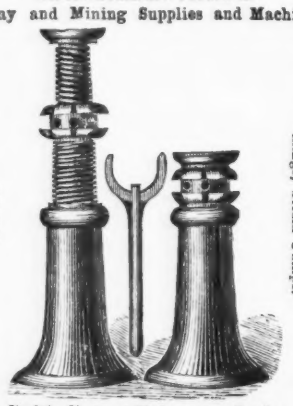

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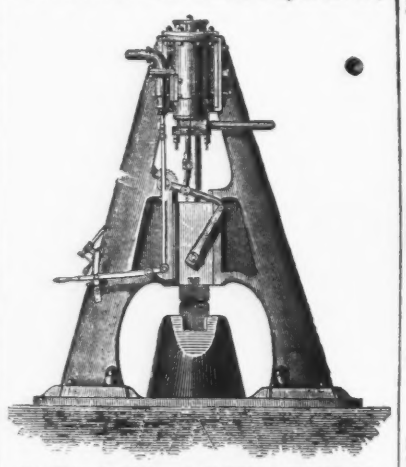

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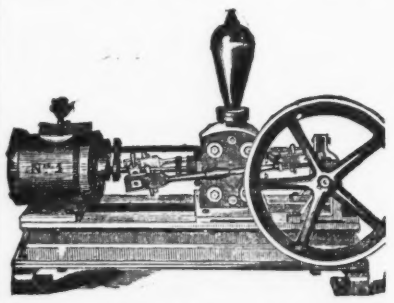

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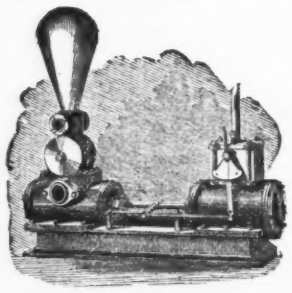

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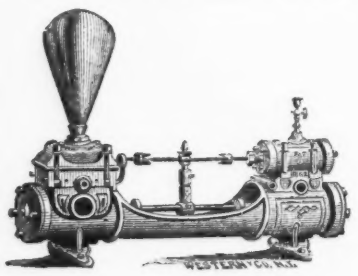

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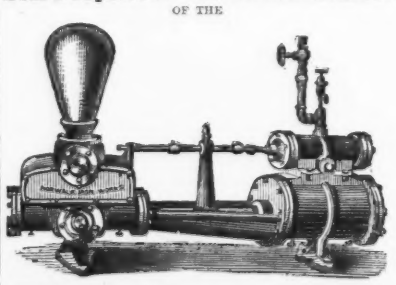

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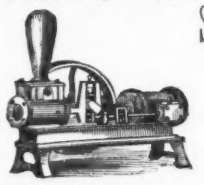

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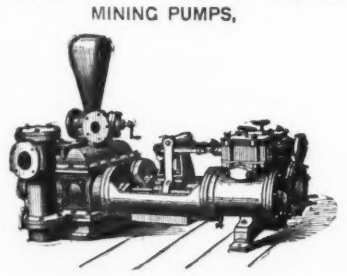

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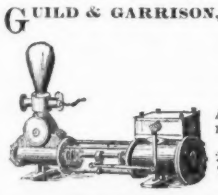

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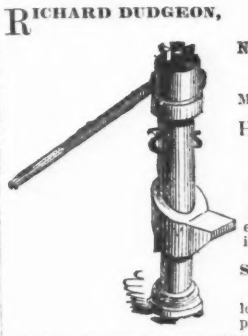

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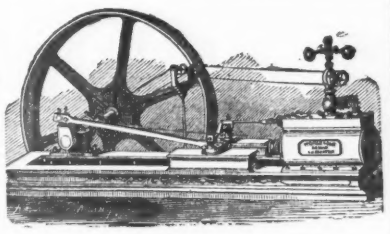

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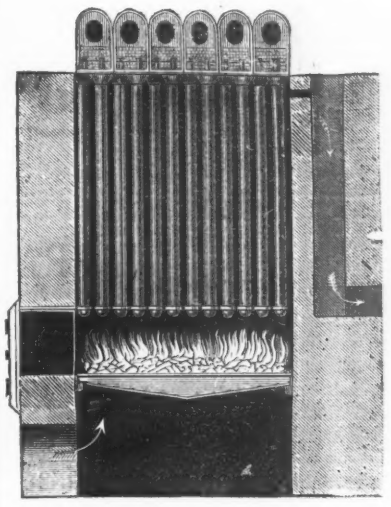

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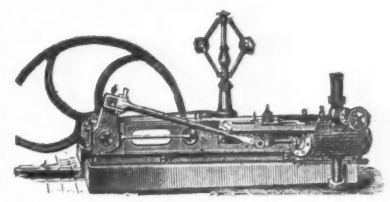

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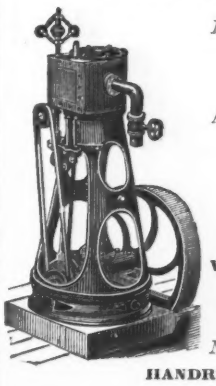

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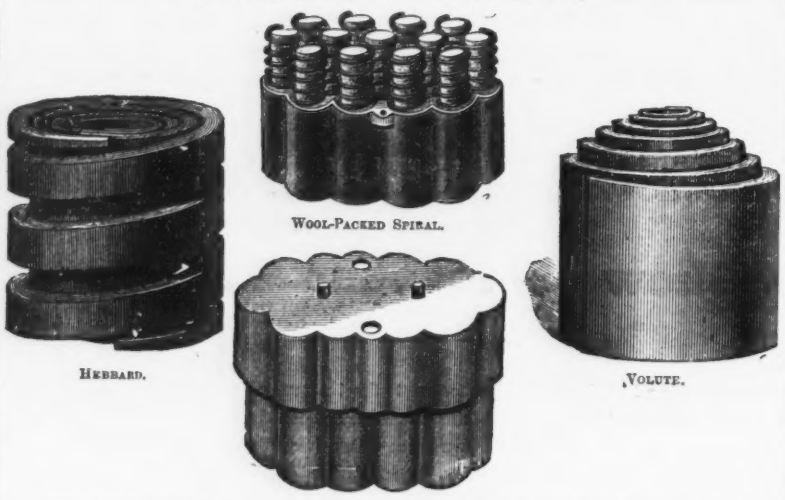

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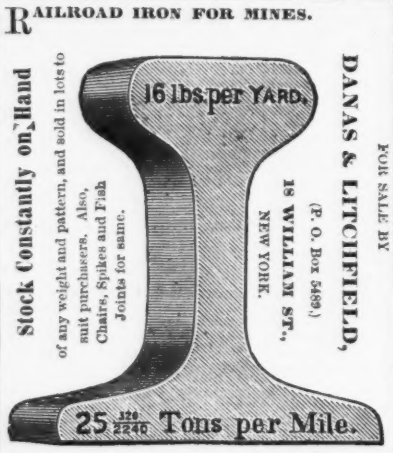
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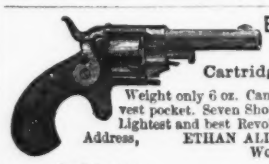

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